

Aviation Week & Space Technology

18 C-119

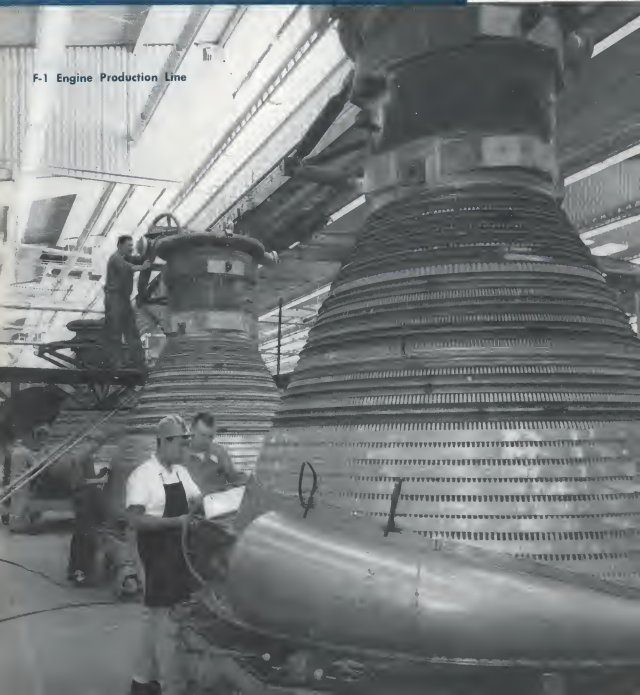
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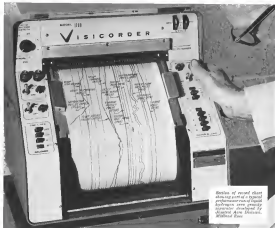
June 25, 1962

Vought Builds
Space Pack

USAF Trains
Guerrilla Force

F-1 Engine Production Line





Section of record chart showing part of a typical performance test of liquid hydrogen; wave groups disappear at about 1000 psi. (Courtesy Aero Division, Westland Inc.)

The Honeywell Visicorder Oscillograph tests liquid hydrogen systems in "space"

The Aerojet Aero Division of Westland Flow Corporation uses a Model 1106 Honeywell Visicorder Oscillograph to measure and record line temperatures and pressures at their new cryogenic test facility at Columbus, Ohio.

In order to simulate conditions as they exist in space, a wide variety of flow rates and pressures must be measured accurately and dependably. The 1106 Visicorder provides detailed with direct records of data on inside hardware and systems which operate on liquid hydrogen, liquid nitrogen, and other cryogenic fuels.

The new Aerojet facility includes a 500-gallon Dewar, 6' deep and 4' in diameter, that accepts components for static or dynamic test up to this size. Pressures range from 1 psi to 70 psi, and flow rates vary broadly because of the size of the test system.

Honeywell—pioneer in the science of oscillography—offers a wide range of Visicorder Oscillographs to suit your budget and your test requirements. The 36-channel Model 1023 is the most sophisticated, the 16-channel 1436 costs the least per channel. In between are the 6- or 14-channel 904C; the intermediate 26-channel 1236; and the compact

24-channel 1505. Most models record at frequencies from DC to 5000 cps and all have many more, convenient operating features.

For details, write: *Mississippi-Honeywell, Westland Division, 6099 E. Dry Creek Road, Denver 10, Colorado.*



The Honeywell Model 1436 Visicorder Oscillograph is used in the Aerojet test room.

Honeywell

H *First in Control*

CAPABILITY is spelled f-u-e-l p-u-m-p-s

Inherent high contamination tolerance and pressure balance of vane-type fuel pumps for turbine engines insure high reliability and increased service life even under less-than-ideal operating conditions.

Fuel pumps capable of operating without inlet filter are now a reality as the result of the Vickers Aeroquip Division vane-type fuel pump's ability to meet the rigid contamination tolerance requirements of MIL-E-5005B.

Benefits resulting from elimination of the post filter include reduced weight, improved system reliability and vibration characteristics, and reduced maintenance.

Design Simplicity—Because vane-type fuel pump components are much simpler than those required with other designs, they are manufactured from a broad range of materials. Thus, Vickers design engineers can select materials with high contamination tolerance, exceptional corrosion and oxidation resistance, and permit handling of fuels having low lubricity.

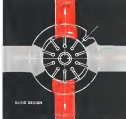
Pressure Balance—All pressure induced radial forces are balanced resulting in zero radial loading on the shaft bearings. Direct benefits are: low bearing and journal wear, reduced weight, higher speed and pressure capabilities, increased reliability and service life.

Mounting Flexibility—Base pump cartridge can be an integral part of a fuel control body or provided as an independent pump with or without provisions for fuel control mounting. Weight and overall package size reductions are substantial with integrated designs.

Vickers vane-type fuel pumps are capable of operating at pressures ranging to 1000 psi and higher at external fuel speeds. Small size units can operate at speeds to 20,000 rpm. They can be produced in sizes providing 100 to 70,000 pounds per hour.

Get more data in Bulletin A-5347A, Vickers Incorporated, Detroit 32, Michigan.

Contaminant, prepared to meet MIL-E-5005B (non code, sharp silica sand, coarse Arizona road dust and fine), is delivered continuously by conveyor at rate of 41 grams per 1000 pounds of fuel during contamination test. Liquid contaminants are added simultaneously.



Because pressure induced radial loads are balanced, need for balancing rotor and bearing journals integral in design. Spine drive allows rotor to align shaft properly with side plates, independent of bearing journals and journal wear.



Two vane-type fuel pumps, typical of the Vickers line currently in use, include the unit in background rated at 60 gpm at 3000 rpm and 1900 psi and the unit in foreground rated at 4.5 gpm at 6200 rpm and 1900 psi.

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DIVISION OF WESTLAND FLOW CORPORATION

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Pacific Division equipment includes heavy duty VR-88 cargo winches, CL-64 loaders (above), and mobile jacks. Write us regarding your particular need.

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ASTROSPACE CALENDAR

(Continued from page 5)

Champaign, Ill. Space Station, National Aeronautics Admin., Pasadena, Calif. of NASA.

Aug. 19-20-Pacific Energy Conference Cos. former American Institute of Electrical Engineers, Paramount Blvd., San Francisco.

Aug. 21-26-Security Symposium on Satellite, Missile and Space Technology, U.S. Air Force Academy, Colorado Springs, Colo.

Aug. 22-23-NAVY, Aerospace Corp. Aug. 14-16-Congress Engineering Conference, University of California at Los Angeles, Los Angeles, Calif.

Aug. 14-17-International Conference on Fusion, Electrostatic Measurement, Boulder Laboratories, National Bureau of Standards, Boulder, Colo.

Aug. 15-17-Nuclear Propulsion Conference, Monterey, Calif. Joint Meeting Institute of the Aerospace Sciences, AAS, and Rocket Society, American Nuclear Society.

Aug. 15-17-Field Interchange Electronic Control Packaging Symposium, University of Colorado, Boulder, Colo.

Aug. 15-16-Lafayette Electronics, Lafayette Living Corp. and American of the French Foreign Legion, 1st Boston Air Mass, Baton Rouge, La.

Aug. 15-16-National Meeting and Conference, Aeronautical Council, Pasadena, Pasadena, Calif.

Aug. 20-21-Tribal Symposium, Process Technology Manufacturers Assoc., 301 W. 10th St., Los Angeles, Calif.

Aug. 22-24-Western Electronics Show and Conference, Institute of Radio Engineers, Los Angeles, Calif.

Aug. 21-24-International Symposium on Air Infrared Spectroscopy, Science, Gibson, Ill., Chicago, Ill.

Aug. 21-24-Military Control, American Systems, Defense Air Force Systems Command.

Aug. 21-24-17-19th Session, International Civil Aviation Organization, Rome, Italy.

Aug. 21-24-Quarterly Regional Meeting, U.S. and Local Transport Admin. West Coast, Anaheim, Calif.

Aug. 21-24-Conference on Thin Films, Colorado State, Colorado Springs, Colo.

Aug. 21-24-AMIE Technical Conference on Advanced Electronic Materials, Boston, Boston, Mass.

Aug. 22-24-1-2nd International Congress, International Council of the Aerospace Sciences, New Congress Hall, Stockholm, Sweden.

Aug. 27-29-1-2nd International Congress, International Federation of Industrial Engineering Societies, Mexico.

Aug. 28-30-Fourth Conference on Materials of Electronic Equipment, Electronic Industries Assn. (in cooperation with Department of Defense) University of Colorado, Boulder, Colo.

Sept. 17-National Advanced Technology Management Conference, Institute of Radio Engineers, Seattle, Wash.

Sept. 17-18-International Symposium on In (Continued on page 9)

Involvement: LIFE



SURVIVAL...

When the safety and preservation of human life is concerned, every element involved has vital responsibility. The Stanley-developed impact attenuator illustrated above, for instance, while weighing only 2 lbs. and occupying only 40 cubic inches, is capable of absorbing 4000 ft.-lbs. of energy. Extreme in performance efficiency, the unique "flower pot" helps cushion the landing impact of the survival capsule now operational on Conquest's B-58 bomber.

The fact that the "flower pot" can react to high side loads... that it is insensitive to environmental extremes... and that design to any desired force history is possible... means that it can become one of the important ingredients of space vehicle rendezvous and landing techniques.

To assist in the development of this and other advanced programs, Stanley offers qualified specialists exceptional challenges, opportunity for career achievement, creative freedom, and personal satisfaction in both working and living conditions.

Facilities opportunities now exist with Stanley in astronautics, computers or design engineering, physics, and other similar disciplines. Direct your confidential reply to: P. E. Wright, Personnel Manager, Mail 104,

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Ready, set...

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Polaris-bearing submarines roam the seas with a lot of cargo—their guidance systems programmed to steer and target—able for worldwide launching. But the missions of these submarines require constant and complete monitoring of their sensitive Polaris missiles to maintain that state of constant readiness.

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of this content in a design built-tested for the rugged requirements of submarine environment.

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LOCKHEED ELECTRONICS COMPANY

PLAINFIELD, NEW JERSEY

A Division of Lockheed Aircraft Corporation

AEROSPACE CALENDAR

(Continued from page 7)

September Thome, Institute of Radio Engineers, Brussels, Belgium

Sept. 8-9-1961 Flying Display and Exhibit for Society of British Aircraft Constructors, Farnborough, England

Sept. 17-Symposium on Measurement of Thermal Radiation Properties of Solids, Edinburg, Host: Dryden Otto Spitzer, Aeronautical Vehicle Division, ONAS, No final Bureau of Standards NBSA

Sept. 20 14th Annual National Conference on Applied Microscopy, American Microscopical Society, Hampton, Va.

Sept. 18-19 Annual General Meeting, International Air Transport Association, Dublin

Sept. 15-16-1961 Annual Engineering Management Conference, DRI Hotel, New York, New York

Sept. 17-20-1961 4th Air Defense Vehicle Meeting, Institute of the Aerospace Sciences, Shoshon Hotel, Washington

Sept. 18-19-1961 National Conference on Aerospace Economics, New York, New York

Sept. 19-20 Technical Aerospace Office 10th Meeting, Institute of the Aerospace Sciences, Hotel Commodore, New York

Sept. 19-20 Operations & Maintenance Symposium, Aircraft Corp., MD-60, St. Louis

Sept. 19-21-1961 National Conference on Test Technology, Western Union Auditorium, New York, N.Y. Spitzer Advisory Group on Electronic Devices

Sept. 19-21-Second International Agricultural Aviation Congress, National Space Agency School, Capri, France

Sept. 24-25-1961 International Assembly of Congress, American Rocket Society, St. Louis, Missouri

Sept. 25-26-First System Conference, American Rocket Society, Memorial Hotel, Santa Monica, Calif.

Sept. 26-Oct 2-1961 General Conference, International Astronautical Federation, Mexico, Mexico

Sept. 26-29-Society of Experimental Test Pilots 56th Annual Meeting, Society of Test Pilots, Beverly Hills, Calif.

Oct. 1-14-Second Annual Exposition & Symposium on Traffic Control and Unmanned Aircraft, Las Vegas, Nev.

Oct. 2-4-1961 Symposium on Advanced Propulsion Concepts, General Dynamics Corporation, AFOSR, General Electric

Oct. 15-17-1961 1st National Head Start, Mass. Space Institute of the Aerospace Society, U.S. Navy

Oct. 18-19-1961 Symposium on Space Propulsion and Measurement, Institute of Radio Engineers, Santa Monica Hotel, Culver, Mich.

Oct. 28-29-Symposium on Dynamics of Manned Landing Platform Entry, Philadelphia, Pa. Attendance limited, for information, Institute of Radio Engineers, Room 1072A, General Electric Co., MSRD, Valley Forge Space Technology Center, Box 955, Philadelphia 1, Pa. Co-sponsors: AFOSR

Nov. 18-19-1961 1st Meeting and Space Flight Exposition, American Rocket Society, Pacific Auditorium, Los Angeles, Calif.



IN AEROSPACE, MARQUARDT MEANS...

Thermionic Pioneer

Thomas Edison, in 1883, first noted electron emission from a hot cathode in a cooler anode during his development of the incandescent light bulb. Today, this basic effect is being used for the direct conversion of nuclear, solar, and chemical heat to electricity.

As a leader in the field of energy conversion, The Marquardt Corporation is engaged in projects extending into the major areas of direct conversion—thermionic, magnetohydrodynamic, and electrochemical. These projects are resulting in new orders of efficiency and reliability—and are opening unusual terrestrial and extra-terrestrial applications.

Energy conversion typifies only one aspect of Marquardt's outstanding efforts in advanced research and development. Scientists interested in participating in these are invited to contact us.

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CORPORATE OFFICES VAN NUYS, CALIFORNIA
"An Equal Opportunity Employer"

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The United States
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Highly sophisticated space research instrument.

No ordinary household mouse this He's Perognathus longimembris, the Little Pocket Mouse from the southwest desert.

He drinks no water at all. One of the smallest mammals in the world, he weighs in at only 6 to 10 grams fully grown. And he'll hibernate or estivate at the slightest provocation. He simply goes to sleep when it gets too cold or too hot, or food runs short.

We have big plans for these little animals at Northrop Space Laboratories. Nature could scarcely have designed an instrument more ideally adapted to investigate the long-term effects of space radiation and weightlessness.

A box just 6" by 6" by 16" could hold 100 hibernating pocket mice—enough to comprise a reliable sample—and everything needed to keep them alive in space for several weeks. Such a package could be

put into orbit quite easily, left there as long as necessary, and recovered for study with the mice still quietly sleeping.

This is just one of the many projects we have in work at Northrop Space Laboratories. Others cover such fields as plasma and nuclear physics, planetary physics and chemistry, materials and structures research, and space systems engineering as well as the manifold aspects of life support systems for space environments.

We have much to learn about the hazards of prolonged exposure to space conditions before we can afford to risk men on such long term projects as moon exploration or manned space stations. The Little Pocket Mouse may well give us a reliable and inexpensive short cut to much of this knowledge.

NORTHROP

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All-Metal Pipe and Tube Joints for Zero Leakage in Aircraft, Missiles, Ground Support Equipment

Unique CONOSEAL Joints have capabilities up to 100,000 psi., temperatures from -423° F. to +1000° F. with zero leakage.



CONOSEAL FITTING is locking on to 1/2" For high vacuum and working pressures of 1000 psi. and bond pressures up to 10,000 psi. at temperatures from 70 to 1000°F. (optional) Seal-off fittings can be purchased for pressures up to 100,000 psi.

Stiff and medium weight CONOSEAL Tube and Dual joints. diam. 1/8" to 1/2" For pressures up to 4,000 psi. temperatures -423° F. to +1000° F.

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You are assured high performance dependability when you choose Marmar All-Metal Pipe and Tube Joints for aircraft, missile and ground support equipment applications. Absolutely leakproof at extreme temperatures and pressures, CONOSEAL Joints are providing optimum performance in a wide variety of aircraft and missile systems: fuel systems, liquid oxidizers, liquid hydrogen, pressurized

gas systems, liquid oxygen and RP-3 systems and a few of the types of applications CONOSEAL Joints will handle with ease. Compact and lightweight, CONOSEAL Joints will meet your most demanding specifications, including connection of dissimilar metals.

Get full information. Ask your Marmar Field Engineer or send the coupon below.

WHY MARMAN CONOSEAL JOINTS ARE LEAKPROOF



1. The CONOSEAL joint consists of a male and female ferrule. Inside circular groove (male) and a raised circular ridge (female) align to form a tight seal.



2. Ferrules being pressed by the V-shaped, conical surface during assembly. This action forces the ferrules to form a tight seal.



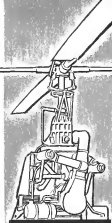
3. Completely compressed ferrules. Leakage of V-shaped and CONOSEAL design insures complete seal. This action forces the ferrules to form a tight seal. Mechanical advantage of the V-shape is approximately equal to one inch of ferrule length.

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Today's tactical maneuverers at tree-top level have put new demands on helicopter capabilities. Out of the Hiller growth-planned family of rotors comes the H-23D-1, to meet these demands with complete service qualities which it alone possesses.

Highest Power In Its Class — A continuous rating of 385 horsepower with the Lycoming VO-440 engine, now standard in the Army H-23D.

Performance Where It Counts — More power means more maneuverability with greater safety. Example: The H-23D-1 has an unrivaled vertical climb at military-specified gross weight.

Designs are one thing. Deliveries another. Both come from

HILLER AIRCRAFT CORP.

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Ruggedness — An obvious requirement in an agile, top-performing aircraft. The H-23D-1 is designed to the highest flight and landing load safety factors in its class.

Proven Logistics — Today's H-23D "Black," standard for the past four years in the Army's logistics system, becomes the new H-23D-1 by only converting to new power. All other dynamic airborne components have flown with this engine in many thousands of successful hours on the similar H2E and H4 helicopters.

The H-23D-1 offers today's capabilities — not yesterday's — with today's logistics system — not tomorrow's.



5

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BOEING VERTOL HC-130 CHINOOK
Primary Tactical Transport Aircraft

Ultimate reliability, extended overhaul periods, and maintainability were primary requirements in the design of the Boeing Vertol HC 130 helicopter. For development, manufacturing and production of the all-important transmissions for what has been called America's "most powerful helicopter," Boeing Vertol looked to Foote Bros.' total capability for the answer. In production and flying, the Chinook is meeting—in full—all of the U.S. Army's primary requirements.

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DESIGN
A completely staffed Design Engineering Group with a solid record of development of systems and component design and development.

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Extensive test facilities plus test stand design and procedure experience ensure to the letter compliance with specifications.

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Long experience in working with many prime contractors gives us the ability to meet quickly and easily the successful completion of preliminary development.

PRODUCTION
Foote Bros. production facilities and facilities are keeping pace with the ever increasing demands of the aerospace industry for greater product reliability.

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EP O-RING SEALS DEVELOPED BY PARKER SEAL COMPANY

A new O-Ring material for sealing Skydrol 500A has been released by the Parker Seal Company.

Believed to be "a first," the manufacturer reports that the development of an Ethylene Propylene Rubber O-Ring compound has resulted in a major improvement in physical properties essential to sealing Skydrol 500A. This achievement has been confirmed by functional-environmental tests at both the manufacturer's testing laboratories and in customer tests.

The new compound, ES15-8, exhibits outstanding resistance to Skydrol 500A fluid as evidenced by the fact it does not continue to swell during long-term aging, will not extrude readily under high pressure, and provides excellent wear resistance in critical dynamic applications.

Perhaps the most significant contribution to Skydrol sealing is the resistance of ES15-8 to high temperatures. All testing to date demonstrates that this compound is effective over a temperature range of -65°F to 300°F. This lessens the danger of premature seal failure caused by inadvertent testing of Skydrol by "hot spots" in the hydraulic system.

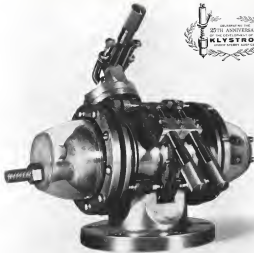
In addition, ES15-8 exhibits excellent abrasion resistance and is practically unaffected by ozone and weathering.

These new EPB O-rings are now available in all AN and MS sizes. Parker Seal Company's standard sizes, and in special sizes with some additional lead time.

For more information, including a test report, write to the Parker Seal Company.



Parker SEAL COMPANY
Culver City, California and Cleveland, Ohio



Early klystrons delivered only 5 to 10 W against a relatively narrow bandwidth. Today's Sperry klystron family blankets the spectrum at outputs from milliwatts to megawatts.

EXPERIENCE: how Sperry sets the pace in microwave tube competition

The invention that built a \$110 million-a-year industry

This year is the 25th anniversary of the klystron. In 1932 the klystron became a reality under the auspices of Sperry research. Since that time, new Sperry developments have constantly expanded the microwave tube family's usefulness.



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June 22, 1962

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Vol. 35, No. 24
Reader AWP and ART

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► McNamara directs sweeping revision, warns USAF it must fulfill or lose close combat support mission.

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► Soviet plans for South America, Cuban route spur heightened program to expand U. S. airline influence.

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► Jet provides extended travel range for worker, attitude stabilization and life support for four hours.

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EDITORIAL

Reflections at Midyear

As 1962 approaches the midyear mark it is evident that this year will be one of the liveliest and most significant in the recent history of the aerospace industry and its customers. While the rest of the nation relaxes into the summer vacation, deadlines the aerospace industry is facing force months of ferment and major policy decisions that will determine the pattern of its technology and economics for many years to come.

Major decisions looming in space technology will be National Aeronautics and Space Administration's action in mid-July to chart a top priority path to a manned lunar landing. This decision is being billed as a choice between the earth orbital rendezvous with tanker mode, advanced by the Marshall Space Flight Center, and the lunar rendezvous shuttle bus technique, originating along NASA's Langley Research Manned Space Flight Center axis. But we suspect that what will finally emerge from the NASA decision making machinery before the end of July will contain a good bit of both techniques organized into a solid two-pronged push rather than a phlegmatic bet on one single technique.

Another product of the summer's ferment will be the radical shakeup demanded of the Army and Air Force's non-nuclear war tactics by Defense Secretary Robert S. McNamara (see p. 26). This is a gaudy long overdue. Out of the workings of the Hovey board and its related groups should come a truly modern concept of air mobility that will keep industry happy to develop the required equipment.

Merger Questions

On the future front the shadow of two future mergers dominates the attention of the Civil Aeronautics Board and the airline industry. Whether the proposed American Eastern Air Lines merger will develop into a domestic air transport giant, and whether Juan Terry Trope will attain his long-sought goal of domestic routes and a chosen-entertainment U.S. monopoly in the international field through a merger of Pan American with TWA are the decisions that will shape commercial air transport's future.

The abrupt departure of Gen. Fredrick Smith, USAF's war chief of staff and the appointment of new pilot Gen. William Feltus "Beet" McKee to this No. 2 spot portend some interesting shifts in the high command for

next year that will be reflected in maneuvering for the remainder of 1962. It seems most unlikely that a new pilot would be appointed to succeed Gen. Curtis LeMay when his term as USAF chief of staff expires about a year hence. Big questions in the Pentagon is: For whom is Gen. McKee keeping that chair warm?

Aerospace Industries Association some hard personnel decisions in finding an adequate replacement for August G. Einarsson as its president. His successor will need the ability to continue the program he had begun to shake out the redundancy from its professional staff and transform this group into an effective working agent for the aerospace industry. Air Transport Association must handle a similar problem in bolstering the professional quality of its staff. Both segments of the industry will face increasing complexities in their relations with the government.

Military Space Dilemma

Another major decision that must come from the White House is whether the Pentagon is going to be permitted to develop an adequate military space program. If such a decision is not forthcoming soon, the prospects for being badly outmaneuvered in this field by the Soviet Union will increase. It is worth recalling that only ICBM and space technology programs were regarded only after it was evident that the Soviets were moving faster in those technologies. As a result we unnecessarily sacrificed the advantages of initiative and ended our position of international leadership. To make a similar mistake in the military applications of space technology at this late date could be fatal.

How much the recent Pentagon military space security directive will affect the pace of space technology through its "need to know" provisions should become evident during the rest of this year. Both industry and Congress should watch carefully for any attempts by the authors of this "need to know" provision to use it as a device to achieve despotic control of technology.

The first six months of this year have forced the aerospace industry to change many of its traditional concepts of management, technology and financing. The prospects are strong that the impact from these months will seem mild in retrospect as the policy decisions come seaborning out of the stormy summer months and continue to fall into the fall.

—Robert Holt

This bolt has a 300,000 psi room temperature tensile strength...and is reusable at 900°F



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WHO'S WHERE

In the Front Office

James L. Mauer, vice president military sales, Douglas Aircraft Co.'s Aircraft Division, Long Beach, Calif.

Dr. S. Don Wadsworth, a vice president Philco Corp., Philadelphia 19, and general manager of the Computer Division

John H. Wiegman, executive vice president Corl, Monroe Co., Chicago 11

Ray G. Clark, S. Hera (USA, Inc.), vice president, Myron Electronics Corp., New York, N.Y., and president of Myron Electronics Division

Paul Jennings, vice president marketing and sales, Charles Farnham Corp., Phoenix 1

Dr. Winston E. Kuck, vice president research, The Bendis Corp., Detroit 14

Bert M. McHenry, Ford's chief corporate director of engineering, publicity and information, chief of staff of Auto Service Corp., Cedar City, Calif.

Col. Pedro A. Chapa, president, Mexican Airlines (CMA)

Gerrard Alarich Engineering Corp. Bellingham, N.Y., has announced the following appointments: William J. Hoffman, for newly vice president/manufacturing and a member of the Executive Committee; Ed and Harold, director, Manufacturing Division; Joseph Horvath, production manager; Leonard Wheeler, manufacturing engineering manager; Dean Brown, design identification, Training Program

Dr. Gerhard W. Bauer, chief assistant, Peckel Meissel Range, Ft. Meigs, Calif.

Honors and Elections

John R. Moore, vice president of North American Aviation Inc. and president of the Astronautics Division has been named recipient of the Theodore Naughton Award for 1961 by the Institute of Navigation

Ned A. Armstrong, president of the National Aeronautics and Space Administration's Flight Research Center, has been named recipient of the 1961 Distinguished Service Award by the Institute of Navigation

James W. Gaudin, executive director of Radiation, for the Advanced Concepts Group has been named the National Aeronautics and Space Administration's 1961 Distinguished Service Award by the Institute of Navigation

J. T. McClure, director of publicity and publicity control for General Dynamics/San Diego has been named board chairman and chief operating officer of the American Society for Quality Control

C. J. McCarthy, assistant counsel and former board chairman of Cessna Aircraft Corp. has been elected president of the Flight Safety Foundation

Flight Safety Foundation's award for distinguished service in advancing safety education at aircraft has been presented to Squadron Leader A. C. Jones of the Royal Canadian Air Force's Institute of Vectors Medicine. The Foundation's distinguished service awards are presented by American Wings and Wings Technology

(Continued on page 9)

INDUSTRY OBSERVER

Industry compliance over the telescopic nature of negotiations was as conspicuous in contract studies of the major S2A-C-130 contract. Some program was a factor in these negotiations. Requirements for the studies (AW June 4, p. 34) which touched off many reactions in the White House (AW June 18, p. 26) were left intact, and USAF's Space Systems Division is expected to conduct an industry-wide competition soon instead of negotiated procurement.

USAF's proposed Project Moon (Minuteman Orbital Space Station), formerly called MTSS (Maneuver Test Space Station), would use Apollo capsules brought from National Aeronautics and Space Administration and North American Aviation Inc., as orbital ships, but would require a land to sea, month-to-month servicing structure. Present structure initially would be experimental bi-directional facility, then become space research and control center. It also probably would serve as servicing and resupply base for manned S2A vehicles.

Program to develop a facility for mechanical manufacture of microsystems using electron or photon beams, which can deposit scale range of conductive and non-conductive materials, multiple semiconductor junctions and make spot welds within a single vacuum chamber, as planned by USAF's Aeronautics Division. Qualified companies interested in making proposals must notify ASD by July 4.

Industry proposals for Phase 2 study contract of Project Albatross, Navy plan for an orbiting sea surveillance satellite which could indicate numbers of ships in particular bays, not only as being indicated by Navy Pacific Missile Range, Ft. Meigs, Calif. Albatross is a successor of the earlier Navy To-Go program which envisaged a single-orbit surveillance satellite. Project Albatross program is in early study phase, receiving low-level funding.

National Aeronautics and Space Administration is considering launching Earth-orbiting Apollo-Satellite (ASAT) from a new pad to be constructed at White Sands Missile Range, N.M. Original plan was to adapt Redstone Pad No. 5 at Atlantic Missile Range for this purpose, but being schedule at AMR is so crowded that White Sands entered the picture.

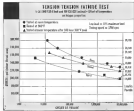
As Phase planning study, called KPS (Range Instrumentation Planning Study), which is to investigate likely range instrumentation requirements, is to be completed in 1970, will be awarded to industry by USAF's Electronic Systems Division. Study proposals were requested recently.

McDonnell Aircraft Corp. has proposed to Defense Department a growth version of F4H-1 Phantom II four-engine jet fighters which would represent performance in some areas as much as 35%. This version would use Allison AR18B engine with higher thrust-to-weight ratio. Overall performance parameters would approach or equal proposed F111A (formerly TF30) variable geometry-wing tactical fighters.

Companies expected to submit proposals for outfitting a third ship and enhancing out of a fourth in Atlantic Range Instrumentation Ship (ARIS) were: General Dynamics, International Telephone & Telegraph, Lear Siegler, Kollsman Corp. of America, Raytheon, Sperry Rand and Westinghouse. These companies' strategic goals for RCA FPD-2 solid state to be employed in ships 1 and 2 rather than the integrated Sperry version based on Global tracking order in ships 1 and 2 (AW June 11, p. 10).

Arce Onshore Missile Command is considering the possibility of testing an advanced submunition version of the Nike Zeus missile against a low orbiting carrier vehicle during the Kryptonite test series. An onshore missile would be an extremely high acceleration solid propellant weapon.

Aeronautics Division of Ford Motor Co. is conducting theoretical studies for USAF Space Systems Division on infrared radiation characteristics of exhaust flames and atmospheric gases, aimed at refinement of satellite-borne early-warning ballistic missile launch detection systems.





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Washington Roundup

Secrecy Controversy

Defense Secretary Robert S. McNamara has directed the Air Force to try to draft an unclassified version of the directive closing military space activities to secrecy. Air Force, in the hot low days, has been working with the House Special Government Information Subcommittee which requested the declassification in a letter to McNamara (AW June 11, p. 25).

But it is still uncertain whether Subcommittee Chairman John Moss will go ahead with hearings on the new secrecy policy. He told Aviation Week he would like to have an unclassified version of the directive in hand first as well as more data on the impact of the secrecy policy. Despite growing concern, industry groups have been reluctant to put their feet on a mine-field in Rep. Moss' domain.

Rep. Otto Teague, second ranking Democrat on the House space committee, is putting an opposite course by pushing for more space secrecy, not less. He tells Staff Department and White House officials have been giving him the run-around in his effort to persuade the Kennedy Administration that the National Aeronautics and Space Administration is revealing too much valuable information. Rep. Teague now plans to take his case directly to President Kennedy.

Centaur Slipping

Centaur's second flight test may slip from its scheduled October launch date to early 1969 because of damage inflicted on the vehicle by a shock wave from the recent explosion of an Atlas F-1 at the General Dynamics Aerospace testing facility in Symington, Calif., near San Diego, Calif.

Damage was so major that General Dynamics had to disassemble the Centaur tankage, then putting the program off schedule. National Aeronautics and Space Administration is trying to find ways to make the October launch date, but the outlook is gloomy.

The probable delay causes considerable widespread competition in Congress and elsewhere about the whole Centaur program. Chairman Joseph Keith of the House Space Sciences Subcommittee last week wrote NASA that he "felt acutely aware" during the Centaur hearings that the second launching would not be delayed, but had since based unofficially the date had slipped to January, 1969. NASA declined public comment.

Rep. Keith's subcommittee is pressing the building teachers on a report which strongly criticizes the management of the Centaur program. The report probably will be released this week.

High-Energy Fuels

Congress is displaying a positive attitude toward such high-energy fuels as borane and borane combinations. The House authorized NASA to spend \$500,000 to test these fuels and the Senate space committee described them as sound, but did not transfer the money to the research and development account as industry wished (AW June 11, p. 27). So the money will do little to help develop these high-energy fuels.

The high-energy fuel industry received another setback when Chairman George Miller of the House space committee refused to let its representatives attend the hearing June 15 when NASA and Air Force witnesses discussed results of borane and borane research. One reason for the ban was the Air Force request for a restricted and closed hearing. Another was Chairman Miller's reluctance to provide a new session even about space research efforts.

But Rep. Keith reacted from the hearing dismayed about the lack of emphasis on high-energy fuel research. He said his space sciences subcommittee, which called the hearing, will push for more emphasis in the field.

Red China Buildup

Civilian and military intelligence officials are split in assessing the Chinese Communist buildup of air and ground forces on the coast opposite Quemoy and Matsu. Civilian authorities consider the concentration may equal the start of an actual attempt to capture the islands to bolster the prestige of the Red Chinese government both at home and abroad. But military officials interpret the buildup as a show of force, not the prelude to an offensive. The White House and late week that President Kennedy was watching developments "with concern."

General Accounting Office is expected to start paying more attention to NASA contracts. Special auditors of the House appropriations committee have urged a closer look at the space agency's expenditures and GAO has promised to do so. GAO, however, has quietly called off its study of NASA-Air Force implications at the Atlantic Missile Range on grounds there are too many policy questions involved.

—Washington Staff

DOD Orders Army Shift to Air Mobility

McNamara directs sweeping revision; warns USAF it must fulfill or lose close combat support mission.

By Larry Woods

Washington—Defense Secretary Robert S. McNamara has told the Army to wake up to traditional concepts of tactical mobility by shifting to air transport, and warned the Air Force that it must fulfill its role of close combat support as late as the 1970s.

In directives aimed at the two services in mid-April, McNamara emphasized that he desired that every possible unconventional concept be explored to enable the land soldier to fight better in difficult surroundings such as those now being encountered in Southeast Asia. Part changes will go into effect next year, and long-term plans will extend to 1975.

Aviation Week was told that high-level Administration officials are closely interested and active in reshaping strategy and forces to fight less than an all-out war, especially counterinsurgency actions. The aviation industry has been asked to help in exploring new ideas and will participate in developing new vehicles, especially of the short takeoff and landing (STOL) and vertical takeoff and landing (VTOL) types.

Guidelines also indicated that the close troop support mission of the future would be designed for relatively low-level operations, leaving the role of defending enemy fighters to an aggressively fighter force.

Army Secretary David J. Stoltz Jr., after a specific suggestion by McNamara, appointed Lt. Gen. Hamilton H. Howze, the first Director of Army Aviation, to head a board to coordinate the transfer of ground control of the theater war to McNamara May 15. A final report to him is due by July 31.

and recommendations for consideration by the National Security Council and the President will be completed by Sept. 1.

Air Force Action

Air Force responded by activating a special air warfare center at Eglin AFB, Fla., to provide increased counterinsurgency technical support. Hearing testimony at Eglin, Gen. Gilbert L. Probst, two groups comprise the center—the 1st Air Commando Group and the 1st Combat Application Group. Officials similar to those assigned to the Army were given to the Air Force (see p. 74).

Gen. Howze, also commands the Strategic Army Command (STRAC) and the 11th Airborne Corps at Ft. Bragg, N.C., appointed 17 generals, major officers and civilians to participate in seven working groups.

Although no studies have yet been

completed by either service, these are the significant recommendations as outlined to emerge:

- Development of advance vehicles, probably with VTOL and STOL capabilities, that can fly to the zone in one combat theater where the Army would be involved.
- Increased emphasis on development of lightweight weapons at the expense of close combat heavy weapons.
- Elimination of all conventional means of ground transportation and the forces needed to maintain it.
- Reorientation of logistic support.
- Development of new tactics to fit the altered environment.

Army sources indicated that the McNamara guidelines are so sweeping that top officials were cautioned that the results of the Howze board were not to be received by the Air Force as the Army would dilute or veto its recommendations. It is notable that some members of the board have stated that themselves with an anxiety in the past.

Industry Aid Sought

One of the first actions of the Army Tactical Mobility Requirements Board, which is the focal point of the Howze group, was to ask the aviation industry for ideas. In a letter sent May 25 to every company with capabilities in developing advance vehicles, Maj. Gen. Clifford F. von Kutz, acting for Gen. Howze, stated that the studies are being conducted with high priority for a very tight deadline and "in a stress phase completely divorced from traditional transports, current doctrine and present programs."

"By consideration of fresh, bold, unorthodox concepts," he continued, "we seek to exploit fully the technological, doctrinal and organizational potentials now in a few forward concepts representative of the great capabilities of all combat functions including reconnaissance, surveillance, target acquisition, mobility or maneuverability, firepower, logistical support and command and control."

The letter requested information submissions of data, including conceptual drawings, charts, graphs, photographs and motion pictures. Submissions were to reach the board by June 18.

Because of the extended lead time to be covered by the board—1963 to 1975—companies were asked to indicate the true time of their suggestions and when the system or piece of hardware would be available. The suggestions were to be made at no cost to the government.

Companies were assured that propo-

erty material would be protected and that distribution would be limited to official sources on a "need to know" basis.

Von Kutz, who is also a former Director of Army Aviation, is head of the advanced arms working group under Gen. Howze. His personnel duty is assigned to Deputy Chief of Staff for Operations of the U.S. Army Corps.

USAF Effort

The Air Force effort, centered in the 1st Combat Application Group, is not as widespread as that of the Army. It is faced with trying to address the responsibilities of the several divisions of the Refuel and Munition of the Armed Forces, written in November of 1956, which the Administration had accused of neglecting. Specifically, these are close combat air support, and to a lesser extent tactical, reconnaissance and conduct of the battlefield with low-level nuclear weapons.

Army demands for relatively slow, large load-carrying and long endurance aircraft for close combat support were largely ignored until recently. The first Air Force action to obtain systems hardware for the need was the recent purchase from the Army of two Cessna 441 Mustang reconnaissance aircraft, which will be configured to carry close support armament. These will be allocated to determine whether such is actually the need in counterinsurgency actions.

Otherwise, the Air Force has concentrated on air commando operations. This includes training of allied crews in all phases of airborne operations such as low-level drop techniques, support and coordination with ground forces. It is planned to use some of supported guerrilla activity, reconnaissance and interdiction raids.

The Air Force counterinsurgency effort so far has resulted in a number of North American T-28 aircraft for use by the Air Force and the Navy as trainers, being configured for single warfare. Other counterinsurgency plans have been applied to the Douglas B-26 Invader bombers, the Vickers Viscount L-25 daylight transport and the Douglas C-47 light transport.

Representatives in the Army from the Howze board studies could result in changing the situation of that service. For instance, it has been proven that air transport in the Army's combat zone is radically cheaper than conventional means. Considering the cost of building roads and bridges, maintaining transportation paths, building warehouses for storage of material, establishing and maintaining forward hospitals and moving other activities tied to slow ground transportation, the savings become apparent.

Companies were assured that propo-

Short Bros. May Cease Operation

London—Short Brothers & Harland may go out of business by 1965 unless new orders for the Short Belfast transport turboprop fighter are forthcoming from other civil or military customers.

The working order of Belfast last week from C. E. Howarth, chairman, who had been put in the Belfast at that airport. So far, the Royal Air Force has ordered 30 and last week ordered three would be as more added to that figure, as it has in the past (AW May 13, p. 79).

Wingsman and Short Brothers with "need to fill the Belfast." The company is now in a position of financial crisis, with the Belfast being the only product of the company. The Belfast is now in the hands of the British Royal Air Force, which is now in the hands of the British Royal Air Force, which is now in the hands of the British Royal Air Force.

A civil version of the Belfast has been submitted to world airlines, including British Overseas Airways Corp. (AW May 4, p. 57) but no sales have been made. Company is presently having its Belfast turboprop transport hopes on the fact that development work of a new aircraft, such as the Hawker Siddeley or Bristol Aeroplane designs will be profitable to the British economy.

Elimination or reduction of these functions would affect the combat air support, reconnaissance, hospital corps and transportation corps.

Elements of an mobility group could be used to carry out such as reconnaissance, air support, moving air refueling troops for active front line combat.

Armed and armament would be reduced, changed in character. New aircraft weight savings enable one man to be a rocket that picks the same power as a large bomber or fighter plane. Tanks would no longer be necessary. Conventional large aircraft would be replaced by smaller aircraft.

Working Groups

The Army Tactical Mobility Requirements Board is divided into the following working groups, in addition to the combined arms group mentioned above:

- Long range group, headed by Brig. Gen. Robert H. Williams, Ft. Rucker, Ala.
- Low-level group, headed by the Chief of the Directorate of Defense Research and Engineering.
- Strategic area group, headed by Brig. Gen. Charles Billingsley, Washington, D.C.
- Inter-theater and oceanic/continental long logistical operations group, headed by Maj. Gen. Norman H. Vining, Ft. Rucker, Va.
- Operations research group, headed by Frank A. Felt, Jr., Washington, D.C.
- Policy is president of the Research Analysis Corp. has, a non-profit company sponsored by the Army. He was formerly a member of the staff of DOD.

• Field tests group, headed by Brig. Gen. Edward L. Rorer, Ft. Bragg, N.C.

• Programming and budget group, headed by Brig. Gen. William B. Bragg, N.C. The board's central strategy committee includes Brig. Gen. Walter B. Rutherford, director of combat development, Army Headquarters, Brig. Gen. Frank M. Oles, present Director of Army Aviation, and the working group heads.

Senior officials on the board, other than Brig. Gen. Edward L. Rorer, are: Brig. Gen. George W. Perez, Brig. Gen. John J. Lane, Brig. Gen. Charles H. Edwards, Brig. Gen. David B. Porter, Maj. Gen. Stanley R. Landon and Brig. Gen. Frederick W. Boyer.

Other officials on the board are: Col. George W. Petrus, Col. A. J. Rankin, Col. John N. Baker, Col. George S. Beatty, Col. Jack Mansueti, Col. John Klingensmith, Col. William E. Dupuy, Col. A. C. Kirtland Jr., Col. Gay Isaac and Col. Louis E. Light.

Implementation of an mobility would complete a top-to-bottom new generation of the Army (AW Apr. 16, p. 128).

Boeing Studies Anti-Satellite System

Boeing Co. is conducting internally funded studies of an anti-satellite weapon system with the assistance of a team of aerospace companies including General Electric, Hughes Aircraft, Minneapolis-Honeywell and Systems, Electro.

The studies are being pursued under Project STEEN (Space Threat Evaluation and Neutralization), a follow-on to an earlier in-house study program for an anti-satellite system called FREED (Program for In-Orbit Destruction).

At least one subproject made of STEEN operations might be for a manned spacecraft system.

Each of the four companies studying Boeing on Project STEEN is responsible to different technological phases of the program. Hughes' contribution, for example, is believed to be in the sensor and guidance area.

While an earlier primary Air Force-funded Boeing program, the Ron-Wedge program, the STEEN effort is built around operational concepts not directly aimed at the three-hour battlefield vehicle which Boeing is developing for the Air Force.

Ron-Wedge was a series of studies aimed at reducing ground elements, largely Dye-Sensor, of unmanned and manned military spacecraft for mission tasks in reconnaissance and bombing (AW Apr. 16, 1963, p. 24).

It begins with the Air Force Special Weapons Center "Basic Orbital Strategic Systems" (BOS) contract, Number AF20(60)12836, and extended through several Air Force study requirements and other efforts. Among the programs which worked in the Boeing on Ron-Wedge were the first in the STEEN project.

Tiros 5 Orbit Elliptical, But Photos Good

Washington—The Delta satellite's north-to-south successful launch last week propelled the Tiros 5 weather satellite into an elliptical orbit—a satisfactory but not ideal status for assessing the growth and track of tropical storms.

Goal of National Aeronautics and Space Administration was to inject the 1,200-lb. satellite into a nearly circular orbit about 150 stat mi above the earth's surface, but because of a malfunction in the main command guidance system carried by the vehicle's second stage, orbit actually achieved was an ellipse of 164 stat mi and a perigee of 95 stat mi.

Nevertheless, according to reports from the U.S. Weather Bureau, television pictures transmitted by Tiros 5 probably will be equal in quality to those achieved by Tiros 3 and 4 from similar orbit. Tiros 3 spotted from, can. Either last summer two days later, satellite would have detected the storm's position. Tiros 4 transmitted about 30,000 usable pictures before quality became unacceptable last month, 121 days after launch.

NASA and Weather Bureau scientists last week were predicting that Tiros 5 would have a useful camera life of three to five months. If this holds true, next launch in the series will be attempted during the fourth quarter of this year, in order to keep at least one active Tiros in orbit continuously.

According to the Weather Bureau, picture quality of pictures transmitted by the satellite from altitudes near its

apogee cannot be determined for about three months. However, because the rates of camera coverage increases with satellite altitude, these undoubtedly will be somewhat less detailed than photographs that those would have been had Tiros achieved its planned orbit.

Tiros 5 circles the earth the same as did its predecessor. With a capability for storing up to 72 magnetic pictures on each of two magnetic tape recorders, the camera in command can be photographed both the whole picture in the Arctic and the Northern Hemisphere's hemisphere and tropics repeating ground.

Inclination of Tiros 5 is 58 deg, or exactly what was sought. This should prove adequate to collect photographic data on ice conditions in far north in the winter, which will be taken from Scandinavia, Iceland and Feroe banks, Alaska.

Antarctic inspection

With a period of 108.5 min., Tiros 5 should orbit the Northern Hemisphere from June 18, its date of launch, until June 29, then circle over the southern hemisphere for 35 days and swing north again in its southern orbit. The satellite is expected to photograph the fringes of the ice pack surrounding the Antarctic continent.

Present orbital track will pass Tiros 5 over the Northern Hemisphere from on both days August and September, the height of the storm season.

Because of the malfunction in the Bell command guidance system, the Delta second stage engine could not

be shut down, and, as a result, they continued to generate thrust until fuel was exhausted. This gave the satellite a slightly higher velocity than had been intended, which pushed it into the elliptical orbit. All Delta stages and various functions interfused with this exception, NASA said.

A computer technique is being used to determine, which orbit is used to determine and predict up to three weeks or longer, what the satellite's fixed camera will be pointed. This allows pre-determination of the part of the earth to be photographed, and the photographic angle which pictures are taken.

The technique was developed partly by Dr. Joseph S. St. Louis, Goddard Space Flight Center, who devised a mathematical prediction formula, and as Johnson's Research Machines Federal Systems Division group, headed by Robert Mueller, which converted the formula to instructions for an IBM 7090 computer.

Stored in the computer are mapping and prediction information, such as magnetic and gravity field variations, and satellite orbit constants. With this information, the computer is fed satellite orientation data obtained from the previous to make camera angle predictions.

Berlin, Tim camera operate on command, meteorologists are able to predict the weather. The camera will be most useful in knowing the camera angle. The camera angle can be checked when losses by comparing a magnetic and stepped around the elliptical structure which develops a track.

The 1960 also compares Tiros orbital elements and sun angle.

Two secret satellites are built by Bell Corp. of America under contract to NASA, Goddard Space Flight Center.

Ryan VTOL Simulator Will Cost \$450,000

Flight simulator for use in development of General Electric F-4E fighter jet V-1000, aircraft carrier for Air Force is nearing completion at the Ryan Aeronautical Co. plant in San Diego.

A 6,000-sq ft Systems Division and Simulation Building will house the environmental cockpit, hydraulic and control system modules and also will be completed to supply the standard stability and control characteristics. Cost of the facility and its equipment is \$440,000. The simulator is to be installed in July.

Europeans Plan 500 Launches During Coming Eight-Year Period

By Carol Burdette

Paris—European Space Research Organization (ESRO), its contractors have plans to launch 500 satellites and other spacecraft in the coming eight-year period, beginning in 1963, with plans of at least 10 launching rockets.

ESRO's satellite program is based upon its first step, launching Western Europe and United Kingdom launch, within the main of satellite space research and probably will be made from sites in Great Britain and from the Tiros T-1000 site located in the Indian Ocean off the coast of Somalia.

Newly formed but long planned, ESRO is expected to concentrate on development of specific payload programs with the European Launcher Development Organization (ELDO) providing booster vehicles for evoked satellite probes.

Nations Committed

Seven nations have committed themselves to ELDO from last (AW, Apr. 21, p. 28), as of this agreement at the ESRO convention in Paris. A seventh, the United Kingdom, is considering the project presently through a project as of its Western rocket launch for satellite launchings.

United Kingdom, France, West Germany, Italy, The Netherlands and Belgium are members of both agencies.

Spain, Switzerland, Austria and Sweden also participate in original ELDO discussions, but all four nations subsequently withdrew from the agency.

All nations participating in both ELDO and ESRO are members of North Atlantic Treaty Organization, while four nations participating in ESRO alone are outside NATO. In addition to the present 10 signers of the ESRO convention, Denmark and Norway also are expected to participate in the program. Both are NATO members and both have participated in original ELDO discussions, but later withdrew.

As the program was started, the ESRO budget over the eight-year period is planned to be \$1.5 billion, with three major contributions, Great Britain, France and West Germany, providing 74.4% of the total. The remaining 25.6% will be divided among other participating nations.

After its formal move forward in 1963, ESRO planned to allocate to about 40 space launch probes in 1964 about 40 of them in the launching rocket field. A series of satellite launchings in conjunction with ELDO is scheduled to get under way in 1967.

A French scientist who participated in formation of ESRO and last week, that, while the United States has no direct connection with recent United Nations activities in Geneva, however, increased international collaboration in space research (see p. 57), the organization should work closely with the U.N. and with the Committee of Space Research (COSPAR) objectives, he said, include meteorological and geophysical research as well as launches toward the vicinity of the moon and studies of the solar system as a whole.

Despite general aid of the new organization, the COSPAR, president of the French National Center of Space Research and his country's representative to Geneva sessions of the technical subcommittee of the U.N. Committee on Peaceful Uses of Outer Space.

Co-located satellite launch vehicles for ESRO probes will be built around ELDO's de Havilland Blue Streak as present booster, a French second stage and a West German third stage (AW, Apr. 9, p. 28).

Meanwhile, a growing non-profit European industry association, Eurospace, with more than 50 active members is gaining acceptance, with the support of planning European governments on a par with U.S. and Soviet efforts and capability over the next decade.

Present objective according to its association statement, is to "bring Europe within 15 years to a technical level equal to other countries through actual achievement," making those possible with ESRO and ELDO as well as on its own as part of original research plans.

A number of American companies, including several large aircraft manufacturers, also have joined as associate members of European Active countries include Germany, France, Belgium, and the Netherlands, Sweden, Italy, The Netherlands, Switzerland, United Kingdom and Germany.

Europeans, which hopes to avoid duplication of effort among its members and to make the most of its research and development resources, plan to set up a clearing house for European space work and merge them through designed to meet ESRO and ELDO objectives.

Advanced Syncom

Washington—Hughes Aircraft Co. will receive a contract for about \$13 million from National Aeronautics and Space Administration to develop long-term advanced Syncom, an advanced geostationary orbit communications satellite, a follow-on to the T-1000. Syncom which Hughes is now developing for NASA.

The advanced Syncom, expected to measure about 5 ft. in diameter and weigh about 900 lb., is intended to be launched into a geostationary orbit orbit using an Atlas-Agena vehicle. The advanced Syncom will use a relatively simple spin stabilization technique in combination with attitude control using its own reaction wheels. The satellite will be launched with one orbital station (AW, June 11, p. 50).

Results which has received \$2.2 million of additional Atlas funds for one station of three orbital ground stations which will be used in NASA's initial Syncom communications satellite tests.

DOD to Study Shift Of Contracting in U.S.

Washington—Study of implications of the shift in geographic distribution of defense contracts has been ordered by the Defense Department.

Report released by Deputy Secretary of Defense Roswell S. Gilpin last week revealed a heavy shift in production of defense contracts from the northeast to the southern tier of states, especially California, from fiscal 1951 to fiscal 1960. Gilpin said the report was completed as a result of inquiries made from New York and southeastern congressmen.

Dr. Robert F. Stroudman, economic development adviser to the assistant secretary of defense for mobilization and logistics, will coordinate the study which will consider the effect of the shift on the national economy and individual communities, and whether the nation's economy and development is being hurt by the shift.

Gilpin's study of major production contract increases rose from 13.6% in 1950 to 13.9% in 1960. Biggest increase was Michigan, which dropped from 9.5% to 3.7%. Other states which gained was Massachusetts (from 2.3% to 4.8%), Texas, from 3.2% to 3.5%, and Colorado, from 0.7% to 2.7%. Other losses were Indiana, from 4.5% to 1.6%, Illinois, from 5.6% to 2.6%, Ohio, from 3.7% to 2.6%, and Wisconsin, from 2.3% to 1.9%.

In the area of research, development, test and engineering, California led in fiscal 1961 with 41.9%. New York followed with 12.2%.



Mackup Shows StarLifter Design Detail

Mackup photo shows details of Lockheed C-141 design in construction work began recently at Monterey, Cal. Flight station, above, has relatively complete engine layout, with basic systems replacing conventional dual engines in some test.



Pershing missile battery moves to get selected launch site during firing demonstration. Lead vehicle carries missile body on cradle/launcher. Other vehicles carry dry workload and communications equipment. Demonstration took place at Orlando, Fla.

Pershing Firing Demonstration Shows Field Use



Army crew, shown, moves workload to missile, while other crewmen prepare missile for launch. Erection to firing position takes about one minute. Separation of missile's next supply line of missile. Operation took less than 15 min.



Industry Study Outlines Measures To Cut Cost of DOD Procurement

Washington—Defense industry last week outlined its recommendations for eliminating unnecessary costs in military procurements in a detailed study submitted to Secretary of Defense Robert S. McNamara.

General theme of the study, reported by McNamara in March, 1961, is better use of the profit motive to encourage greater efficiency. E. V. Ingalls, president of the National Science, Industrial Arts, and Commerce, Inc., president of Westinghouse Electric Corp., headed the task force which began its work shortly after an NSIA symposium on cost reduction last June. About 200 persons from 62 companies were members of the 10 task groups which considered the study.

The study's key recommendations include: intensive type contracts be awarded from negotiation under the Renegotiation Board's exemption in short. If the Board does not agree to use exemptions permitted in its regulations, then the Defense Department would recommend to Congress that the Renegotiation Act be amended to void the exemption condition.

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Profit Limitations

In addition, the study said that the profit-making provisions of the Warrent-Price Act and the Merchant Marine Act be repealed or amended to exclude intensive type contracts.

The Renegotiation Board already announced that it would be willing to consider carrying intensive type contracts (AWM No. 2, p. 21), but made no firm commitment.

These specific means of ending cost reduction efforts most effective were suggested.

- The more firm fixed-price contracts and use them earlier in the procurement cycle.
- Use incentive and penalty features when cost reimbursement or cost-plus-fee contracts are appropriate.
- Establish price analysis rather than cost analysis as basis.
- Eliminate overlapping and multiple review of contracts and subcontracts performing external estimating services, avoid business proposals and other related items.
- Place technical and procurement groups under a common leadership and responsibility.
- Encourage alternative proposals which offer product improvement and cost reduction possibilities.
- Reduce government control of defense industry in order to permit the defense program to benefit from the inherent

art of cost control and incentive provided by the free enterprise system.

One major area studied was simplification of specifications. It was stated that unnecessary preparation, issuance and interpretation specifications have led to duplication and misapplication of effort.

Mixing of administrative data and technical requirements within a single specification may result in incompatible bids and inconsistent compliance and performance, the study said.

Standardization Urged

There is also a lack of standardization of nomenclature, definitions in describing requirements and providing of specifications, the study said. Documents are often hard to find and an excessive amount of time is spent in finding them, resulting in increased costs and program delays.

The case for this, NSIA says, is the establishment of new specification standards at the Defense Department level with full responsibility and control for the preparation of all technical documents relating to procurement.

The "program package" concept is cited as an example of the best government industry tool in planning,

installing and finding major weapon systems.

Programs should be classified for budget review as accelerated programs, optimum programs or standard programs. The first would cost more to start, but the second would have the best cost relationship in behavior and the last would save money at the expense of time.

Feasibility Studies

Good studies of technical, cost and schedule feasibility for new weapon systems were endorsed. Research possibilities in contracts for research and development should be considered as a means of advancing industry, the study recommended.

In order to arrive at reliable cost estimates, it was recommended that cost applications of Annual System Procurement (ASAP) be prepared. An improvement in efficient cost estimating by defense industries in the past year was noted. At the same time, the ASAP should be continuously improved and changed to meet new situations.

Separate source applications that require different ground costs should be eliminated, the study said.

Release of preparing proposals was studied on an ongoing contract basis. Estimated use of time and time is industry, through reducing the number of proposals requested, was also recommended.

Early Action Due on Renegotiation

Washington—Two-year extension of the renegotiation law, without change, was being rushed through Congress last week.

The House approved the extension on a voice vote, after a few minutes of debate, a few days after it was recommended by the House Ways and Means Committee. No Senate opposition is expected. Present law expires June 10.

Rep. Carl Vinson (D-Ga.), chairman of the Armed Services Committee, said, "I am disappointed that renegotiation is not to be made permanent law. The bill the House that renegotiation is 'voluntary' because it provides for acceptance of unreasonable profits and 'preventive' because it gives defense officials an incentive to negotiate to keep profits reasonable."

Rep. William Mills (D-Ark.), chairman of the Ways and Means Committee, said his group favored short-term extensions and periodic renewal of renegotiation to Congress because "the possibility is still deeply concerned with the problem that renegotiation is a process which requires, in an annual effort, the exercise of judgment by men where the basic principle underlying

the principle cannot be clearly and thoroughly set down in a statute of law. While the committee did not have time to consider adequately many even recommendations for amendments which were submitted. No hearings were held.

Armstrong Industries, Inc., is a letter to the House to the committee on renegotiation because "various past contracts together with the income tax laws adequately protect against the receipt and retention of an excessive profit."

AIA said that renegotiation "is anarchy and anarchy keeping the efforts of the Department of Defense to lower the cost of national defense by the hostile use of executive type contracts. The harmful effect of renegotiation is in this case has been publically referred to by the Secretary of Defense."

If the law is to be continued, AIA recommended amendments that would place the "burden of proof" of excessive profit on the Renegotiation Board and give contractors the right to appeal renegotiation determinations decided by the U. S. Tax Court.

Traffic Spurts on North Atlantic Routes

By James K. Ashlock

New York-Toronto transatlantic passenger volumes have shown a sharp increase since April 1, and traffic forecasts indicate a continuing volume rise. IATA's group figures are a few better behind the actuals.

Passenger figures for June indicate a continuation of the favorable trend recorded in April and May. The recorded increase for June is up 176,172 additional transatlantic travelers, 36,838 more than in the comparable period of 1961. Workweek traffic also was up, with 148,796 passengers, 35,867 more than in the same two-month last year.

Load factors still are unsatisfactory from the individual carrier's standpoint. Although passenger figures compiled by some airlines indicate workweek load factors averaged approximately 75%, This reflects the increase in capacity, which in April rose to 141,867 seats on east-bound schedules, 14,827 more than in the same month a year ago. Since April, airlines have continued to add capacity, as carriers reached summer sched-ule frequency peaks.

Passenger volume increases as reported by individual airlines vary from 1,000%.

- **Pan American** which increased weekly transatlantic loadings by 100% to 32,111 in April compared with 9,911 in 1961, reports passenger volumes up 5%.
- **TWA**, with its frequency increased to 49 weekly round trips a week, 44 last year, are combined loads rose 27% between April 20 and June 9, with loads up 54%.

- **Lufthansa** had a 300% passenger volume increase in April over the last but it noted it from 1961 to 1962 plus in total passengers added.

- **Scandinavian Airlines System** reported additional loadings up 10% from New York and 8% on other routes.

- **Swedish**, which doubled its in 16 months, U.S. schedules from New York to Chicago this year, saw passenger volume increase up to 10-15%.

- **Swedish** which doubled its in 16 months, U.S. schedules from New York to Chicago this year, saw passenger volume increase up to 10-15%.

- **Sabena** said that business from May 1 has improved 26% compared with the same period of last year. It attributes rise to seasonal American interest in Belgium, evidenced by reports from U.S. passport officials.

- **Pan Am** and **TWA** both claim that bookings were much better except for the widely publicized attack threat from flight engineers in recent weeks.

Carrier spokesmen differ on the effectiveness of the group lines in generating new business. Both Pan Am and TWA

speak favorably of the fares, although both would have preferred earlier approval of these by both IATA and the CAB.

We feel the group fares had three basic approvals, would have been voted some 25,000 more passengers that year, a Pan Am official said. "We'll have to look to stress that figure."

TWA counters that approximately one-third of its June and July advance bookings are group fares. On the other hand, several foreign carriers from the line emerged or so it's too early to tell so far as its business is concerned. Even so, foreign carrier spokesmen say the group fares are the full support and backing in a potential means of load causing the market.

Revenue conditions are a forced thing, point airline carriers in discussing improved transatlantic situation.

The revenue downturn in 1960 is now viewed as a prime cause of the drop in travel to Europe last year, say one official. "But when the carriers began improving a situation, the volume of 1961, people's confidence apparently returned, and they began planning the trip to us, taking care."

That is also the feeling that, in spite of the May stock market fluctuations, the public has enough confidence in economic conditions to invest in travel. The majority of carriers noted there is no remarkable effect on travel as a result of the market drop. However, several airlines feel that any adverse effect will probably not be felt until late June or early July.

"We think a lot of people who had trips planned for later in the season are probably watching the market," says one, warning to let their paper losses will be recovered. "One spokesman and "Whether they cancel those trips will probably depend on the way their stocks go."

Carrier spokesmen note the growing economies of Europe, coupled with all of the U.S. Travel Agency, as a big factor in the rise of workweek passenger volume. In May, for example, workweek passengers totaled 17,504, compared with 99,328 the same month last year. An official of one U.S. carrier said 12-14% of this workweek increase is being carried by the foreign airlines. But the U.S. Airlines are apparently benefiting as well, evidenced by TWA's 32-2% increase in workweek volume between April 25 and June 9.

The increased share of workweek business going to the foreign carriers, in the opinion of airline spokesmen, brought two significant changes.

- It has tended to ease foreign carrier criticism of the U.S. position that encourages Americans to fly U.S. flag carrier.
- It has brought strong foreign carrier backing of the U.S. Travel Agency's activities abroad.

Both Pan Am and TWA are well aware that the foreign flag carriers are taking in an U.S. expenditures overseas traveling travel in the country. Then as long as they are not as aggressive "Visit U.S.A." efforts, Pan Am alone having spent \$4,000,000 in such promotion last year.

All the carriers apparently agree that the U.S. flag carriers' program is a justified endeavor.

"Even though the potential of the campaign has not been reached yet, it can, if properly properly, bring about an expansion of the market," one official said.

Another factor widely credited for passenger increase this year is the increased advertising and sales promotion programs by all carriers. An airline spokesman said that he learned from the growing competitive conditions on the North Atlantic.

"Every airline flying between the U.S. and Europe has new jets which it is advertising, the use of and one airline maintaining offices. In magazines, newspapers, and on radio and television, people are being bombarded with the idea of taking a trip to Europe."

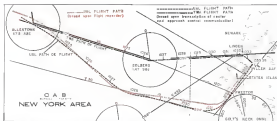
Although most people are desiring to travel abroad, many airline spokesmen feel that the public is either growing more spontaneous, or it is becoming more cautious. "The great capacity to travel abroad, many people are not as nervous about it as they used to be before. This is creating a real problem in airlines' competing their forecasts on the basis of advance bookings. An official of one carrier said there had been a high level of re-consideration in his company to three not advance bookings at a recent forum.

"It isn't so much a problem with weekend flights, when we're generally booked up, one foreign carrier spokesman said. "But so far as weekday flights are concerned, we just don't have an accurate business estimate."

Now as the late bookings appear to become fewer, one thought the category of transatlantic travel is definitely up this year.

"The big export drive has certainly stimulated an increase in business travel. It's not as late as it used to be."

"But the majority of these late bookings are pleasure travelers."



DIVERGENCE OF UNITED FLIGHT 824 from reported flight path is shown in solid line; flight path computed from the aircraft's flight records. Times along routes show positions of the United and TWA flights as they converged. Collision point was computed to be 6,315 ft southeast of the center of Miller Army Air Field. United flight was to hold at the Preston intersection.

Pilot Error Cited in United-TWA Collision

By David B. Hoffman

Washington—Pilot error, not the air traffic control system, was responsible for the crash on May 25, 1962, of a United DC-8 and a TWA Caravelle over Staten Island, N.Y., on Dec. 30, 1960, according to a Civil Aeronautics Board finding released last week.

While United still had the report "under study" late last week, action from the pilots' union was quick and bitter. Finding fault with most blame was down by CAB from facts sought forth in the investigation, airline spokesmen promptly began denouncing the CAB's findings. They urged the Board to accept or modify its last position.

Probable cause of the tragedy, the Board said, was that "United Flight 824 proceeded beyond its clearance height and the confusion of the airport officials in the light of air traffic control." The United jet had oversteered the 11 at which it was to hold in 11 as when the collision occurred. All 128 on board the two aircraft and six persons on the ground died in the accident.

FAA Absolved
In effect, the CAB report absolved the Federal Aviation Agency from blame by holding that the United pilot, not radar controllers on the ground, was responsible for assigning the DC-8 just prior to the collision. The Board ruled that under FAA rules when radar is used to separate aircraft, it is to be kept at least 3 mi apart.

But CAB did not assume any ap-propriate

portion of responsibility for what might happen when pilots fail to respond to the "negative" clearances. The CAB report was cited by the Board as its report.

Capt. E. J. Bechtold, ALPA regional director, challenged the report as being cluttered with facts, logic and common sense. He said the pilot would not have been able to see the TWA Caravelle from the DC-8's cockpit, he said.

ATC had given United Flight 824 a clearance to descend to the Preston level, which was reduced to the Preston level by the DC-8's pilot to prepare for their hold. From this point on, according to

CAB, operational problems that culminated in the accident began to mount in the cockpit.

One of the two VOR receivers on board the jet was presumed to have failed. Although the pilots informed their company of the malfunction, so one reduced the message to TWA and the flight was not given special instructions. About 7 am before the collision the jet was at 20,000 ft and descending more than 400 ft a minute. The pilots, assuming no descent alert to reach 1,000 ft before Preston.

To explain why the veteran United crew, ranging solely by instruments, confused descent and canceled the company's descent alert, the CAB said the pilot was "in a hurry" to reach 1,000 ft before Preston.

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The new TWA Trans World Flight Center at New York International Airport



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This is the new Trans World Flight Center in New York. Architect Saarinen designed it to express the special excitement of jet travel. Its soaring roof and sweep of glass enclose a broad new ideas to speed your departure and arrival—like TWA's fast new jet check-in and boarding, and automatic baggage delivery. International shops are here. Comfortable lounges. Glamorous restaurants. One other fact makes the Trans World Flight Center entirely unique: it's the only airline terminal where routes from 70 cities in the U.S. are linked to routes in Europe, Africa, and Asia. One world under one roof.

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Workshops
developed by



CONQUEST 990 with TWA markings carries the name of both TAI and Scandinavian Airlines System. This International operates two six-city routes at five Eastern nodes as an exchange basis with SAS, which uses the planes on its Copenhagen and Tokyo routes.

which is returning to Thailand by way of Manila.

In Bangkok, the two aircraft are exchanged; the 990 TAI has been using this for returning to Europe on the SAS flight. The International, meanwhile, takes over the usual month and flies it on its schedule to Manila via Hong Kong.

- **Sunday**—Aircraft now operated by TAI returns to Bangkok through Hong Kong and then proceeds on to Tokyo, where it arrives.
- **Monday**—Second aircraft reverts back to SAS as flight SK704 for the trip to Copenhagen.

The shorter five-day availability schedule for the aircraft on alternate weeks is necessary in order to provide time for the normal maintenance routine which the aircraft go through after every second round-trip flight to the Far East.

This, plus other airframe and engine maintenance work, is provided by Swavia in Zurich under terms of the various patch surrounding operation of the two aircraft.

Technically, SAS has the two 990s on a four-year lease-purchase agreement from Swavia. In fact, SAS, a 10% owner of TAI, has granted a lease-purchase option on one of the two aircraft to the Thai carrier. Under the SAS-Swavia agreement, the latter agrees to be responsible for the maintenance of the two 990s, which they receive during scheduled stopovers at Zurich. The still holds true for the aircraft TAI has on lease purchase.

All around, the lease-purchase type pact is necessary to this ownership idea can be explained, making it possible for the aircraft to be legally registered in the nation of the new airline and opening the way for it to be parceled with the individual airlines at the respective carrier involved.

In the case of the two 990s included in the SAS-Thai international agreement one has TWA national markings with the livery painted with the slogan, "This Airways International is co-

operation with Scandinavian Airlines System." The other, still registered with SAS, has the reverse inscription—Scandinavian Airlines System in Copenhagen with This Airways International. Since TAI has adapted the old white and blue colors of SAS, the overall paint schemes of both are almost identical.

Under the present scheduling, the 990s fly without the use of a 990 Tuesday night and Tuesday night of an given week, a coupling factor in view of the increasing jet service, the carrier's major competition are offering nonstop from Bangkok and other key points along the 13-city network. The daily-plus service to points on the same system not served by 990s—must be taken up by the own Douglas DC-6Bs TAI still has on hand under lease from SAS.

Jet Gap

The jet gap is a major factor behind TAI's desire to obtain at least one additional aircraft. Before the two 990s become available on May 10, one TAI aircraft will be needed.

We were the only widely potent operator flying from here, and our load factors were dropping. This is something we will have to build back again—few people realize that Bangkok-Tokyo is almost as far as London-New York."

Passenger load factors during Thai International's two recent all operations with an all DC-6B fleet averaged out to approximately 55%. For the present summer schedule, Traffic and Sales Manager Cherman K. Handberg, as recalled on loan from SAS, anticipates a 93% average passenger load factor for the 990s. The aircraft also place added stress on Handberg's selling job, since they increase the airline's overall capacity roughly by about 45%. Present total production rate is 108 tons as, per week.

This International's local competition is compounded by the severe through Bangkok and other points by a number of major international carriers, including

Pan American, Air France, Lufthansa, British Overseas Airways Corp., Qantas Empire Airways and Japan Air Lines. Locally, the greatest competition comes from Nationalist China's Civil Air Transport and Hong Kong's Cathay Pacific Airways, Ltd., particularly the latter which serves the same 12 points as TAI plus three others: Rangoon, CAT and Cathay Pacific are now flying Conquest 990s.

Another local carrier serving Bangkok is Swavia, a European post partner of SAS, whose schedules also are designed to offer a measure of direct competition to Thai International, according to TAI officials here.

Swavia, which uses 990s over its Pacific routes, also could provide a backdrop for the Thai carrier should one or both of the SAS-TAI jet go out of service. In this event, Swavia would take over at least some of the 990 schedules currently served by the Thai carrier.

At the moment, including out-of-service periods during the winter months, the combined SAS and Thai International schedules for the two 990s are building up to a utilization rate of between 65 and 67 hr per week for each aircraft.

Over a 990 reaches Bangkok it passes under the effective control of Thai International, although it may continue to operate as a SAS flight, and, in order to meet its own schedule, TAI has the authority to delay a SAS flight by as much as 12 hr if necessary.

For the moment, all 990 flight crews are SAS personnel, who sample flights now have like to take jet engineers to under the transition. Thai crews, however, will be integrated into the operation as their experience grows. Navigation is now being turned in Europe, and plans are under way for the use of Thai dual pilots aboard the 990. Most co-pilots on the DC-6B flights are Thai, and three were recently promoted to captain.

The same blend of European and Thai personnel is evident in both the



World's fastest helicopter serves USAF

Sikorsky's S-61 is now serving the U. S. Air Force, flying Texas Tower support missions from Otis AFB, Massachusetts.

The S-61 is the world's fastest helicopter. It cuts Tower trip time one-third and flies the entire mission without refueling.

Two turbines and a boat hull greatly increase range, load, and safety in overwater operation. With its ability to fly 30 men and 700 pounds of equipment off small, windy platforms, the S-61

daily meets Air Force performance requirements. Unlike previous helicopters, it can fly long offshore missions without an escort.

The S-61 has cargo hook, rescue hoist, and automatic stabilization equipment. Production models in military and commercial service have established component durability and extended time between overhaul. The S-61 is the first twin-turbine helicopter certified for passenger service. For additional information, write:

administrative, and technical operations here, with Sikorskyman working as one of the more difficult parts and, at the hope of eventually plucking out an orbiter can be trained and gain the necessary background for the intense Normal maintenance work on the DC-6B is now completed at England's Boscombe Airport, largely by the two pilots.

FAI still is the red hot pecking hard to move into the black over the next few years, was formed two years ago in pounds. Thailand with its international airline and SAS was asked to step in

with technical and financial aid as well as equipment. Its parties, and 70% owner, is the Air Force, and a government-owned carrier operating, primarily into the neighboring countries of Malaya, Laos and Cambodia with DC-4 and C-47 equipment.

During the last two years of operation, The International flew about 3.7 million mi., logging 11,125 hr on the air on 5,188 flights.

Passenger carried during the period totaled 150,000, while 4.7 million lb of cargo plus 322,000 lb of mail was handled.

Goldberg Plan Seen as Victory For FEIA; Some Members Balk

By Robert H. Cook

Washington—Stallions of the air line industry's body-contending get-out-compliance case but a possible road block late last week as members of the Flight Engineers International Association protested their legislative agreement to terms offered by Labor Secretary Arthur J. Goldberg in a historic effort to end a strike against Trans World Airlines.

The major objection is that TWA Chapter President H. S. Dethrich demanded orders from the union's executives control not to negotiate on the aircraft and post-plant mechanics license requirement in the TWA contract.

FEIA headquarters here and members of Pan American World Airways and Eastern Air Lines have registered under objection, but that the union is still insistent the NMB will be satisfied by the members.

Goldberg's offer came out in national pecking began June 20 and quickly ended pending consideration of the proposals. His action following strong White House and congressional criticism of the demand, will not be regarded as a definite victory by the union in its recent jurisdiction fight with the Air Line Pilots Assn. on several major issues including Pan American and Eastern.

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•Possibility of meeting FEIA and ALPA will be studied in a joint committee of the industry, pilots, and a member named by Goldberg.

In action, FEIA has agreed to drop its demands that aircraft land flight registers have an aircraft and pilot identification in a condition of compliance.

Agreement on these points opens the way for further negotiations on wages and working conditions. If FEIA and TWA fail to agree on these terms by June 25, the strike will be a no-strike recommendation by Foran.

The union wants a pay increase of 20% over a three-year period, plus a reduction of monthly flight time from 85 hr to 75 hr.

A presidential emergency board declared to take a stand on the new employment issues in its report on the FEIA-TWA dispute last May, but it recommended a salary increase totaling about 15% which would be a significant step toward a lowering of monthly flight time.

One possibility that may complicate settlement is the recent board order to the Federal Aviation Administration (FAA) to investigate the flight operations of TWA.

FAA refused to participate in that settlement and none of the recommendations for pilot training and flight pilot qualifications are unacceptable to the flight operations.

At the same time, Pan American has been damaged by its own strike and it left in a position of having signed an agreement with ALPA concerning streamlining which could clash with the Goldberg recommendation designed to settle an almost identical situation at TWA.

Yet it is clear, in comparison with the presidential emergency board findings on the TWA-ALPA dispute, that the Goldberg proposal has attracted more of the major FEIA allegations to the Board report and may lead to the first implementation of the Foran recommendations for a gradual reduction of baroque rates to three areas.

California Fares

There are good reasons to anticipate that the fare paid by TWA World Air Lines for the American Airlines, but the California Airlines fare is not. Apparent was by a fare in two parts.

American, with its route flights between San Francisco and Oakland and between San Francisco and San Diego, is not to reduce its additional \$4,000 revenue monthly as a result of the new TWA. Actually, an increase of \$67,500 in monthly revenue, but since it will lose more than \$1 million per year on California route flights.

Sikorsky Aircraft

DIVISION OF UNITED AIRCRAFT CORPORATION

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AVIATION WEEK AND SPACE TECHNOLOGY, June 25, 1962

World Airways Provides New Wings for the Nation's Air Arm



World Airways orders giant Boeing 707-320C convertible cargo/passenger jet transports...

- to provide high volume, jet speed airlift for the U.S. Air Force's Military Air Transport Service,
- to offer the nation a truly jet-age charter and common carriage service for both passengers and freight



Beginning in July, 1963 World Airways will put at the service of MATS, as well as commercial air transportation assignments, the world's longest range jet transports—new Boeing 707-320Cs. These new Boeing 320C intercontinental jets will carry more payload, a longer distance than any other commercial cargo aircraft. They will provide "best money" cargo delivery in transatlantic, transpacific and transcontinental service. These giant, convertible jets can carry 90,000 pounds at cruise, or 350 economy class passengers, or any combination of the two. Maximum range is more than 6500 miles. Cruise speed, with full payload, is 575 mph. The 320Cs' cargo doors are the largest in any commercial aircraft, permitting the handling of irregular and palletized cargo. Loading systems save ground time for both military and commercial cargo.

World Airways' new Lockheed Boeing jets constitute an important addition to the U.S. Civil Reserve Air Fleet—a logistics reserve fleet.



Oakland International Airport • Oakland, California

SHORTLINES

► **American Airlines** will increase its pattern of inbound flights to several major cities next month. As of July 1, the carrier will operate 14 daily Boeing 707 and Convair 440 trips from New York to Chicago and nine from New York to Detroit. Additional new jet flights will also be provided on the Chicago-Los Angeles and Cleveland-Detroit routes.

► **Civil Aeronautics Board** has approved a new regulation permitting airlines to adjust the costs of fares in Canada when tickets are purchased with lower-value Canadian dollars. The Board's order, effective July 16, states that air fares have suffered significant losses in value of the approximately 85% exchange difference in the currencies.

► **Delta Air Lines** recorded a 56% gain in revenue per mile of air mileage flown last month and a 51% increase in expenses per mile compared with May, 1962. Total revenue, May was \$3,369,000, net miles of air mileage and 428,000 net miles of air expense.

► **Eastern Air Lines** on July 3 will add a daily DC-7B flight to its Air America service between Miami and Boston. Passengers, Philadelphia, Washington, D.C. and Ft. Lauderdale. Two new jet flights will also be added to the airline's Puerto Rico service on first day between New York, Boston, Philadelphia and San Juan.

► **Federal Aviation Agency** has selected three contractors to provide flight food service at Dallas International Airport. Identical contracts involving through 1965 were awarded to Union News Co. of New York, Hot Shoppes, Inc. of Washington, D.C. and Graham Corp. of Toledo, Ohio.

► **National Airlines** last week extended coach service to Key West, Fla., becoming the first airline to provide this type service for even one air station.

► **Northwest Airlines** on June passenger rates and 27.7% last month over the May, 1962, figure. Southern Land fares was 78.6%, as compared with 47.8% for the same month last year.

► **TWA World Airlines** estimates that nearly a third of its transatlantic cargo tonnage this month will fly on the new group fare discount rates. Savings of \$156 to \$255 below the regular transatlantic economy round-trip fares are possible for each person traveling in a group of 25 or more.

AIRLINE OBSERVER

► **Pan American World Airways** is considering purchase of two Votol 107 transatlantic helicopters for operations from the planned heliport on top of the new 99th Street Pan American Building new under construction on Grand Central Station in New York. Pan Am has approached New York Airways as an exclusive carrier from the heliport to J.F.K. Air's terminal at New York International Airport at Idlewild, but NYA denied against the arrangement. New York Airways also plans service from the heliport.

► **Wreck of British Pan Am** segment this week over proposed joint operation at British Overseas Airways Corp. and Canadian Eagle Airways on transatlantic routes (AW June 11, p. 42). Later British members will add, whether BOAC, a non-technical suspension, is expected to share privately-owned Canadian Eagle's losses to return for two Boeing 707 transports. In another action, Canadian Eagle union leaders are receiving comparable wages paid in the transit to bring both airlines to salary perspective. Meanwhile, British Ministry of Aviation Press. The members also in relation to U.S. charter flights into the United Kingdom (AW May 28, p. 47), since Canadian Eagle had withdrawn its disputed request for similar rights into the U.S.

► **White House study** on international air transportation (AW June 18, p. 56) is progressing on schedule. Private contractors conducting the studies report to the White House steering committee last week that the draft report will be completed by mid-July.

► **Airs of National Airlines'** new management, headed by Louis B. Muskat, Jr., is in progress to an eight-foot "in some possible." Carrier hopes to retire its fleet of Douglas DC-7 and Lockheed 1649H Constellation from parts by the end of the year.

► **Inter-European passenger traffic** on scheduled airlines increased 7% during the first quarter of 1963, but a 9% increase in capacity pulled the load factor of carrier operating European routes down 1.5% to 47.5%.

► **New version of the BAC 111** transport incorporating helicopter speed, new wheel braking and 5000 engines of approximately 10% higher thrust, reducing the transport's transport's weight held length requirement by some 16%—is being discussed by British Aircraft Corp. with carriers who want operate in fields where the airplane's current performance is considered marginal.

► **Bozell International Airways**, which now has 12 BAC 111s on order, including its options—now require 20-30 of the transports, according to the airline's owner, now president, R. V. Carleton. Bozell is to receive its first BAC 111 in October, 1964. At that time, a total of 27 of the airplanes is expected to be in service, and 40 are due to be in operation by the summer of 1965, according to a BAC spokesman.

► **Rep. Oscar Brown** (D-Ill.) last week called upon Pan Am's Coast, Va., officials to end busy activity in meeting areas surrounding the new Dulles International Airport which will open in Washington, D.C., beginning the fall. He noted that because the new airport is located in a specially protected area, "a unique opportunity is offered for avoiding or at least minimizing a noise problem."

► **Flow of new civilian reports into Federal Aviation Agency** is continuing at what Administrator N. E. Hobbie calls an "unacceptable" pace despite continued agency efforts to curtail AFR aircraft equipment separation. Flights resumed after an June 12 on American DC-6 and on Eastern DC-7. Both following IFR flight plans, several each other by 200 ft. over the Soling, N.J. VOR. Both were tracking New York routes on the same frequency. Meanwhile, FAA was investigating another report of two aircraft entering for holding pattern over Springfield, Va., at the same time and altitude, the second crash resident there in recent months (AW Apr. 30, p. 41).



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Test for Anti-Collision Systems Developed

By Philip J. Klaus

Washington—Computer simulation techniques, which for the first time permit rapid evaluation of airborne anti-collision systems in a high-density, non-visual air environment, excluding risk of false alarms which might produce collisions where no hazard existed, has been shown by Colleen Radojo Go.

A computer simulation of a type of anti-collision system which makes range and rate-of-closure measurements and uses a vertical escape maneuver shows a negligible false alarm rate in a high traffic area. This was reported by Colleen to the Air Transport Association's anti-collision group at its recent meeting in Cedar Rapids, Iowa, May 7, p. 98. The anti-collision system which has been developed by Radojo is a range/rate-of-closure system (AW Feb. 15, 1969, p. 67).

The ATA has already in a number of cases that the new Colleen technique appears to offer very substantial technical and economic benefits in optimizing a collision avoidance system and evaluating its capabilities. It was a useful program to develop, but the air force hardware need be considered.

The ATA plans to recommend that the Federal Aviation Agency fund additional computer simulations of other proposed collision avoidance systems. Initial work by Colleen in developing the simulation techniques, funded by the company, cost approximately \$140,000.

An FAA spokesman from the Colleen-developed technique "inherent" reliable" and said that company representatives were scheduled to meet with the agency to discuss a continuing program for the next.

The new technique, should permit more rapid evaluation of the dozens of anti-collision system concepts proposed each year to the FAA and the ATA. More are suggested by aviation manufacturers or others who are unfamiliar with the workings of the existing air traffic control system. This usually sets the problem only in its simplest form—two converging aircraft with no other aircraft within a hundred miles.

At this time, the basic problem is a variety of systems proposed would be feasible. But the air collision problem is most acute in the terminal area where dozens of aircraft are in close proximity, usually under radar control. (See p. 99). An airborne collision avoidance system which might prevent a "Grind-Carrier" type collision over every descent but which produced frequent false alarm warnings in the terminal area, resulting in dozens of aircraft taking

erroneous evasive action, could create chaos and cause collisions where no real hazard existed.

Previous analyses of the performance of anti-collision systems have been made using only the two vehicles involved in the threat, because of the difficulty of arriving at a mathematically valid and the lack of realistic data for use in a terminal area study. It was theoretically possible to perform an idealized terminal area traffic situation, but this would not reflect the true situation that occurs because of errors in aircraft navigation equipment and procedural errors by pilots and traffic controllers.

Recent Advance

Only recently, with the availability and use of two large flight track simulators, capable of simulating up to 50 aircraft in simultaneous flight, at the FAA's National Aviation Facilities Experimental Center (NAFEC), has it become possible to obtain data for realistic anti-collision system analyses.

Colleen, which has been selected to the anti-collision system field for some time, decided it could not evaluate the merit of different techniques unless they could be tested in a controlled terminal area environment. This was too costly and time consuming if carried out in actual flight tests, suggesting the need for development of a computer simulation technique.

Such a technique had to evaluate system performance in avoiding aircraft and collisions as well as the frequency of false alarms when no hazard existed. The simulation should also evaluate the effect of such evasive maneuvers on the air traffic control system.

Using a program devised for an IBM 7070 computer, with input data obtained from the NAFEC flight simulators and actual radar data from a study made of the Atlanta terminal area in 1970, Colleen tested out the new technique in a range/rate-of-closure area.

Short-Hand Transport

Washington—Air Transport Association members believe the new short-hand transport for high speed and local service carriers (AW May 13, p. 41). ATA believes it may be necessary to develop two different short-hand transport for the facilities and the other for the local service carrier. Once greatly speeded by the airlines, these specific times would be calculated to determine manufacturers for constant and possible proposals to the individual carriers.

near system of the type developed by Bendix Radio.

Because the two companies are basic competitors for airline inventory equipment, the Colleen results, which indicate the basic feasibility of the Bendix range/rate-of-closure system, testify to the fact that neither is competing to the detriment of finding a solution to the air collision problem as part of the ATA's anti-collision working group.

A range/rate-of-closure system provides adequate warning time for critical evasive maneuvers if both aircraft are using a straight path and are climbing or descending at more than 1,000 ft./min., the simulation indicates.

Maneuvering rates, less than 3 degrees per sec, do not present many false alarms in the terminal area, but the turning time available for an evasive maneuver may be sharply reduced, the analysis shows. This is particularly true for aircraft in steep climb or descent. Using a straight path and one degree to turn into the other.

The computer analyses show that the false alarm rate is high density area is similar to the air traffic control problem complex in the FAA. For example, if two aircraft in the same altitude are approaching each other making turning maneuvers under radar control with safe separation, an airborne range/rate-of-closure system may occasionally issue a collision threat. Colleen's Engineer O. Five reported to the ATA group.

While the studies to date appear to confirm the feasibility of a range/rate-of-closure system, the simulation is based on only 25 hr. of real time data involving 34 incidents of which 12 were potential collisions. Five continued.

Another company spokesman points out that while the analysis indicates the range/rate-of-closure system is feasible, the simulation did not include noise and system measurement inaccuracies that may result from the use of the ground-based technique which Radojo proposes to use to obtain distance between aircraft. He adds that there may be superior methods of obtaining distance between aircraft.

Five also suggested that computer simulation of the airborne collision avoidance system operation might be tried at NAFEC as part of its terminal area simulation, so that the relationship between the airborne and ground traffic system could be investigated. This would enable simulation "pilots" to obtain a complete collision alarm and take evasive action. It also would allow the FAA to determine how ground traffic controllers can best handle such an emergency, and as effect in control of other aircraft in the area.



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The LGP-30 is an unfair competitor. No other computer in its class even comes close. □ You can't find another computer with a memory this large (4096 words—2000 more than the nearest competitor) at such low cost. □ Ease of operation and programming? Even non-technical personnel can master it. You can learn to program the LGP-30 in hours and free yourself from dependence upon computer programming specialists. □ Modifiability? Completely. It can be used by any number of people in any number of places and departments. Just plug it into conventional outlets. No expensive installation. □ Versatility? The readily available Program Library for the LGP-30 will undoubtedly include the program you need—and save you a small fortune. It's the most extensive Program Library in this computer class—and covers problems in gas, oil, and electrical transmission, civil, highway, and structural engineering, product design, chemical and paint manufacturing, metal and mineral processing and many more. □ If you require a larger computing system, take a look at



the LGP-30's big sister for brother—the RPC-4000. Completely transistorized, 8008 word memory, computing speeds up to 250,000 operations per minute. It's the desk-size computer with room-size computer capacity. For more information about rental or purchase, write Commercial Computer Division.



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Hardware?

Maybe connectors were "hardware" twenty years ago.

That's when the P-38 was the hottest fighter plane we had. Pilots were proud when they could hit 360 MPH and go up to 50 or 60 thousand feet. With this kind of performance requirement, most connectors worked without a hitch. You just connected them and forgot about them. The runs and bolts

HOW TIMES HAVE CHANGED

Now we're up around Mach 5 and steadily has been pushed into outer space. Nose cones light up like giant soldering irons and consequences have to operate in a new vacuum.

Fortunately, Amphenol engineers are sure that the old "hardware" concept was headed out the window. Programs racing up were going to need connectors that could put up with terrific environmental conditions of heat and steady cycling. For example, at high temperatures most of the elastomers used as insert materials or connector seals either melt into a puddle, turn into a rubber or set up and lose compression.

What's more, connectors now have to keep on functioning all the time, with no allowance for failure. So—Amphenol designers went to work developing a connector to meet the new space-age standards.

DISSECTING HOLEHEAD

The Amphenol Materials Lab, with the help of a shiny new infrared photospectrometer, began dissecting elastomer molecules. They were able

to pinpoint the weak spots in molecular structure where bonds over-elongate. Then they were able to plan and build new molecules with built-in "armor" to protect against failure. Result: an exclusive silicone rubber compound that maintains its integrity and elasticity under severe temperature extremes and also withstands exposure to violent new propellants like hydrogen and nitrogen nitrooxide.

At the same time, Amphenol design engineers were hard at work perfecting steel to metal shouldering of mating shells that allowed precision control over consequences of the sealing ring. In addition, the axial-to-pull design changed substantial stress reaction times more effectively than resilient clamping. Finally, they incorporated a semi-rigid non-deflection due to external stress exposure under thermal stress.

Having all the pieces, we put them together, called it the Amphenol 48 Series and started testing in the vacu-

um chamber. 48 Series connectors operate very nicely at a sustained altitude of 500,000 feet. They are quite comfortable in the hot box at 200°C without carrying full rated current. They don't even mind going up to 600°C if they don't have to stay too long. In short, Amphenol 48s can take almost anything you throw at them.

PROJECTS WANTED

Amphenol designers have established criteria for demanding customer time temperature current capability. This information will be especially valuable to engineers presently engaged in "vacuum" projects, perhaps the kind of project where previous connectors have failed to measure up to the new space age standards. If this is the case, contact an Amphenol sales engineer. He's a "space age hardware" expert. Or, write directly to Bob Duvall, Vice President, Engineering, Amphenol Connector Division, 1830 South 54th Avenue, Chicago 90, Illinois.



High altitude in low low delivery strength. Also showing its carrying capability. 48 Series Connectors enjoy extremely high voltage safety factors.



With Amphenol 48 Series Connectors, we normally rated at 200°C. They can also withstand considerably higher short-time temperature exposures.

Amphenol 48 Series Meets Mil C 26300 (25A)



Connector Division / Amphenol-Borg Electronics Corporation





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Aeroflot has selected these details on its line to keep up IL-18 aircraft, which will not just below the Tu-114 in long-range capability and is expected to be the most recent commercial aircraft from the standpoint of productivity and low maintenance.

IL-18 Undergoes Modifications

Payload of the IL-18 has been increased from 25,762 lb to 32,664 lb, and passenger capacity has risen from 84 to the new version (IL-18) to 118/125. Main modification is in the IL-184 wing, which has a total of 24 fuel tanks providing 27% more fuel capacity. Wing dimensions, however, remain unchanged. Forward section of the fuselage also has been enlarged. Turbofan engine modification for starting the AL-25 engine. Formerly located in the tail baggage compartment is now in a special compartment in belly of fuselage section, and is located in opening position.





MOCKUP OF A SPACE MANEUVERING PACK designed to stabilize or propel various dragless vehicles in orbit. Shown at left with cover removed, provides four-hour life support system in space suits. Helicopters provide supply of fuel at lower left, nitrogen pressure supply, power supply, stabilization and control units at lower right. Helical antenna located at lower right

Maneuvering Unit to Aid Orbital Assembly

By Ervin J. Bollen

Dallas, Tex.—U.S. Air Force soon will evaluate a full-scale experimental space pack, providing maneuvering capability for free-orbiting spacecraft carrying outside their space craft in a weight loss experiment.

The experimental equipment has been designed and built by Ling-Tecnomat's Aerospace Division under a project sponsored by Flight Research Laboratory at Arnold Air Force Station, Texas. The project is being managed by the Air Force's Logistics Support, Technology Section, Wright-Patterson AFB, Ohio.

Vought personnel will perform final, actual, sustained tests of the equipment under weightless conditions in a series of ballistic-rejection flights aboard an ASD jet transport.

In addition, Vought has delivered a non-operating full-scale mockup to ASD at Dayton.

The Space Pack is a belt-mounted system containing an air stabilization, control, propulsion and power systems plus provisions for a complete life sup-

port system and is designed for a four-hour mission, completely independent of the parent spacecraft.

Equipment is designed to position and stabilize an astronaut during operations outside the spacecraft and provide him with stability in an orbit around his area, permit him to transfer from one space vehicle to another or make it possible for the crew member to become a free-orbiting vehicle for maneuvering spacecraft sections during orbital maneuvers.

Pack Components

The system's equipment to provide all necessary stabilization and maneuvering capabilities is housed in a container back pack 12 in high by 18 in wide and five deep. Slightly more than one-third the available space is all devoted to life support equipment in dividing oxygen, fuel, nitrogen, carbon dioxide removal and air circulating equipment.

Pack also includes power and signal batteries, a hydrogen-peroxide container and nitrogen pressure vessel for provid-

ing propulsion, a pressure regulator system, valves, gas gauges which set in position status and other electronic equipment. Earth weight of the system is 125 lb and inert weight is approximately 20 lb.

The pack has a complete fly-by-wire system, with controls mounted on a small panel located at the crewman's waist for achieving attitude changes to the propulsion system for attitude control and position. System provides movement in six degrees of freedom—pitch, roll, yaw or combinations of these as well as translation capability induced by thrust from the hydrogen-peroxide jets.

Attitude changes can be made by the astronaut using manual controls to override the automatic attitude hold system. Automatic stabilization from the astronaut's hands for performing servicing, maintenance and maintenance. Controls are designed to be operated either by right or left hands. Relieving the controls automatically selects the astronaut in the position he has selected.

Stabilization and propulsion systems are powered by gas jets, and the system is selective so that the astronaut can adjust his position without being propelled from the work site. Jet provides 45 lb thrust forward and backward and 25 lb thrust up or down, with lesser amounts for attitude control and stabilization. Vought Aerospace engineers are that the equipment provides an astronaut with an operating radius of more than two miles on a single fuel tank space for multiple short-range flights at the work site and minor size changes of attitude.

Prime-Mover Mode

In the power-mover mode, four crew members could accelerate 100,000 lb of floating vehicle materials into position for assembly in a speed of one foot per second, assuming it and stopping it in the desired position, producing that function at least three times after having traveled 1,000 ft to begin this task.

A two-way radio is contained in the pack.

The three-panel-mounted maneuvering controls govern attitude and translation movements of the system. Basic manual pitch and yaw are achieved by an up-down, right-left control which moves laterally and is located atop the panel. Control of forward and up-down translation is located on the right side of the panel. Also on the right is a lever, by which panel sets a switch which selects full control capability, or places the device on standby—power on but no control inputs in the jet-and-air, configuration in which, however, the autopilot by means of a separate circuit and permits the crew member to fly by means of the control valves directly.

Torque Controls

Rotation or torque controls command the system jets to produce pure couples in order to provide rotation without translation, drag or motion of the pack itself. This is achieved by the autopilot by means of a separate circuit and permits the crew member to fly by means of the control valves directly.

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The forward-looking jets in the shoulder area and a jet firing forward between the legs are aimed at pack extension while other jets operate between several other angles into the body.

For stabilization and attitude control, Vought engineers studied manual and automatic systems and torque provided by single ion propellers, two gases, inertial wheels, two inertia wheels and gas jets. While the control system does contain gases, these are the only gas jets and thrust at station and do not provide power for the system.

The manual system is composed of a plug-in module to facilitate maintenance and servicing.

Cooperative Satellite Programs To Be Discussed by U.S., USSR

By Cecil Rowland

General-Priorities broadening of vital arrangements for cooperation in peaceful space ventures, agreed upon by U.S. and Soviet delegates at a recent bilateral negotiation here (AV June 11, p. 38), will be discussed at a proposed follow-on meeting in the near future.

A space team to be created to talk between representatives of the two countries in the field of communications satellites.

The negotiations, probably to be held in Moscow, will be a continuation of the Geneva discussion in which U.S. and Soviet delegates recommended that data received from their respective satellite systems be shared by the two countries and made available to other interested nations. Formal discussions of the plan by the two governments is expected to be initiated.

Concrete Moves

Described as a "tangible first step" by one U.S. spokesman, the recommendation was one of several concrete moves toward a potentially broad line for international cooperation in space which were hammered out here over the past two weeks. They include:

- **United Nations World Meteorological Organization (WMO)** proposed the establishment of a world-wide weather forecasting network, including the weather satellites of the U.S. and Russia, sounding balloon balloons and other conventional equipment and techniques.

- **Agreement** in the bilateral negotiations for the establishment of a weather data coordination center in Washington and Moscow by the 1965-66 period to coordinate weather satellite data.

During the bilateral negotiations, U.S. delegate Dr. Hugh L. DeWitt, deputy director of NASA, and Soviet Ambassador Anatoly Blyumovskiy also discussed the possibility of jointly mapping the earth's magnetic field during the 1964-65 "International Year of the Quiet Sun" planned by the International Union of Geophysics and Cosmology during the last year when there will be maximum of solar activity.

A joint statement issued by the two delegations said, "such cooperation would probably involve the coordinated handling of a satellite by each nation in conjunction with ground observations by each other's coast guard."

India also is expected to offer one of its facilities for such a usage.

Both the U.S. and the Soviet Union were represented by the subcommittee.

In the closing session, U.S. delegate Arnold Fritsch, director of the National Aeronautics and Space Administration's Office of International Programs, told the group that the recommendations "lead to a valuable precedent for the establishment of other similar useful facilities in an increasing and effective manner without placing any demand on administrative resources of the United Nations." He added:

"At this facility, any member state will be able to observe, train, instruct, experiment in test for potential, scientific purposes under reasonable conditions. The successful completion of the proposed facility may in due course encourage us to further efforts of a like kind."

Officials said there had been no advance meeting for the bilateral subcommittee to convene here at the same time the WMO and bilateral discussions were under way. One spokesman described the timing as just coincidence. Another spokesman of the panel U.S. Committee on Possible Uses of Outer Space—the legal subcommittee—also was in session here at the time.

Timing of the current WMO discussion with the bilateral negotiations, however, was carefully stepped out in advance, and during the course of the meetings, each body was advised of the progress being made by the other.

Specifically, bilateral negotiations were largely designed by the ground work within the vital area of satellite cooperation that could provide the base for WMO's envisioned comprehensive new wide-area weather forecasting system.

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TIMETABLE TO MARS

Arrive Mars: 19:3 August, 1971 Giant steps were taken recently at Lockheed Missiles & Space Company toward manned exploration of the planets Mars and Venus. For the first time, accurate interplanetary transfer orbits have been plotted to show velocities as related to departure and arrival dates for an entire cycle of planet oppositions. A "fast" round-trip would take a year, allowing perhaps ten days exploration time on Mars.

A preliminary but comprehensive study also was made on the spacecraft's design considerations. Many facets were explored—configuration, single versus multi-steps, weight, thrust, payload, exploding, landing, and return equipment; and many more. The arresting conclusion of Lockheed scientists: A vehicle can perform such a mission within the present state-of-the-art.

Engineers and scientists at Lockheed Missiles & Space Company conduct many other feasibility and research studies, probing for advanced knowledge in a wide diversity of disciplines. Lockheed's constant expansion, its growing leadership in missiles and space, its ever-widening scope of projects, its ideal location on the beautiful San Francisco Peninsula—all open new and unusual challenges to well-qualified people.

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Space Environment Simulator Readied

Specialized space environment simulator, capable of duplicating an altitude of 700,000 ft., solar radiation and control distribution, is being assembled by Spacel Technology Laboratories Inc., Redwood Beach, Calif., and will be completed by October. It will be used to evaluate flight effects of the Orbiting Geophysical Observatory, which STC is building for the National Aeronautics and Space Administration.

Project President Kenneth and Soviet Project Nikita Khrushchev.

Maneuvering from Dr. Decker and Blagovestov was begun in New York earlier this year and then transferred to Geneva to divert with the sessions of the World Meteorological Organization.

Weather Data

The lengthy and interrelated projects advocated by WMO in a report drafted under the direction of Dr. Hans Wobler, director of research for the U.S. Weather Bureau, and Soviet Professor V. A. Ruzhkov, include provisions for a "world weather watch" with a system of international and regional data centers for coastal and distant warning weather data and forecasts obtained from raw material provided by satellite and other means.

Planned Washington and Moscow collections plans plus the proposed Southern Hemisphere one would be the present international center. In explaining the proposed functions of this two types of centers, a WMO report says:

"The world center, which would have access to worldwide data coming from the usual meteorological observations, as well as from meteorological satellites, would also have available the

chemical and costly equipment required for processing and joining together the available information from satellites and other sources. This world center would have the necessary staff and also the communication facilities to disseminate promptly the result of their work.

Regional centers would be established in order to make it available to all countries in the region of each center the vast amount of additional data which meteorological satellites provide. There will be no way to replace but rather to complement national meteorological services."

To allow the present gaps in the world's meteorological observation network, the report proposed what it termed a satellite plan for the establishment of 100 automatic surface weather observations—70 in the Northern Hemisphere and 30 in the Southern Hemisphere. It also proposed an observation, of which 20 would be located aboard ships, 11 on continents and islands.

While the proposal has yet to receive approval from the WMO executive committee, estimated cost of approximately \$155.7 million for surface and satellite stations of the needed equipment and \$10.5 million for ground operations.

Recognizing that the plan in some instances exceeds "national political

ties, international financing will be necessary, especially in the underdeveloped areas, the report says. To breach this gap it recommended that "full use should be made of the possibilities for assistance through the United Nations expanded program of technical assistance and the United Nations special fund for economic development."

It also suggested that the U.N. consider the possibility of establishing a "world weather fund" to support the implementation of the WMO plan of action.

In discussing the financial problems involved in establishment of a world-wide system, the report concluded:

"The launching and operation of the meteorological satellites will, it is estimated, continue to be a national responsibility, and the financial aspects of these activities are not therefore discussed."

While emphasizing that weather satellites implement rather than replace conventional observation means, the report says data from existing vehicles "before results from other sources are generally accepted" can be regarded where the approval of meteorological stations "is considered done." It also said observations by U.S. weather satellites that have:

- Detected the existence of large heat, tropical storms and extra-tropical depressions "which would not have been possible without satellite observations."

- Yielded information about cloud patterns "which were previously suspected and which will be of very great value in a better understanding of atmospheric processes."

- Identified snow and ice fields in a demonstration of their potential for determining the geographic extent of the world's snow-covered land areas. Thus, the report says, "combined with appropriate more dense measurements, should provide information on water level as no way to replace but rather to complement national meteorological services."

- Provided reliable information on solar radiation and the infrared radiation emitted by the earth and its atmosphere. These measurements will enable, "and in the future, it will be possible to monitor a close watch on the incoming solar radiation in all regions," the report said. It added that satellite data will be the key to the upcoming infrared radiation in various wavelengths bands over period observations of the mean temperature of deep layers of the upper atmosphere, and provide a "global picture of the distribution of water vapor and ozone in the upper atmosphere."

In 1955, the report predicted weather satellites will be capable of providing global information on precipitating cloud layers, thunderstorms and surface pressure and temperature, information on the upper winds, partial coverage of the average temperature of the atmosphere, latitude and longitude, and the content of water vapor and ozone in the upper atmosphere.

To make maximum use of the potential, the report said, the following requirements must be met:

- Continuous coverage of one or more satellites transmitting useful meteorological information.
- Redundant stations "in sufficient numbers and with adequate facilities to ensure accurate reception and processing of data for global coverage and utilization."
- Interference-free frequency bands for communications with the satellites.
- Adequate network of ground-based and auxiliary meteorological observations to provide the broad data framework for the detailed observations obtainable from satellites and to help interpret these observations.
- Further development of techniques for operational use of satellite data.
- Communication facilities for prompt world-wide dissemination of the processed data.
- Long-range research program incorporating data from satellites.

To solve the problem of global meteorology, the report added, "we must have global observations which will give us a description of the fields of motion, temperature, moisture, pressure, humidity and ozone to a height of about 80 km (about 50 mi.) and the fluxes of matter and energy through the lower and upper boundaries."

The present status of conventional observations, it said, is deficient in two major respects: "the number of stations and the quality of the observations." And the techniques and devices for the systematic measurement of the atmosphere above 50 km (about 31 mi.) used for the fluxes of heat and moisture from the earth's surface are inadequate.

In an appendix to the report's conclusion, the authors stated that man eventually will be capable of enhancing weather and climate on a large scale and adding:

"Before starting an experiment on large-scale weather modifications, we must be sure of our capability of forecasting accurately the expected modification in the heat balance and the circulation of the atmosphere. Otherwise, we could face some day the dangerous situation of unintended, irreversible weather and climate changes."

The report and its recommendations are scheduled to be presented by the U.N.'s Economic and Social Commission next year in Geneva and the General Assembly in New York this fall.

USAF Contracts

Air Force Office of Scientific Research recently awarded 60 grants and contracts valued at more than \$1.7 million.

California Institute of Technology, Pasadena CA21-55111 for structure of clouds.

Florida State University, Tallahassee FL-32310 for aerodynamic and properties of aerosols.

Columbia University, New York NY-10027 for meteorological calibration of satellite instruments.

State University, Los Angeles CA-90024 for meteorological studies.

University of California, Berkeley CA-94720 for aerodynamic properties of aerosols and spaceborne instruments.

University of Chicago, Chicago IL-60637 for experimental development of improved instruments for satellite meteorology.

University of Minnesota, Minneapolis MN-55455 for the study of certain clouds.

Cornell University, Ithaca, NY-14853 for theoretical and experimental studies in cloud microphysics.

New York University, New York NY-10003 for satellite meteorological studies.

Princeton University, Princeton NJ-08540 for the study of the effects of atmospheric conditions on the detection of satellites.

Massachusetts Institute of Technology, Cambridge MA-02139 for the study of the effects of clouds on satellite meteorology.

University of Wisconsin, Madison WI-53706 for the study of the effects of clouds on satellite meteorology.

University of Texas, Austin TX-78712 for the study of the effects of clouds on satellite meteorology.

University of Washington, Seattle WA-98195 for the study of the effects of clouds on satellite meteorology.

University of California, Berkeley CA-94720 for the study of the effects of clouds on satellite meteorology.

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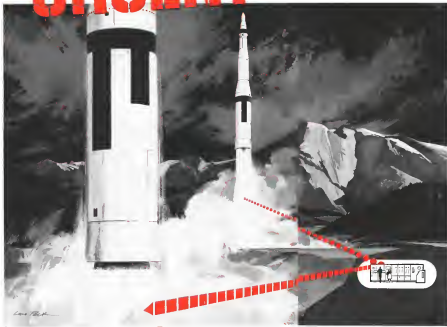
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HELL 471-2 MOTHER SHIP controls an Army H-13E drone in test at Bell Helicopter's Ft. Worth, Tex., plant.

H-13 Drone Tests Battlefield Capability



GROUND-BASED sea pilot drone operator leads the H-13E.

Ft. Worth, Tex.—New tactical uses of helicopters in the battlefield environment, which include the possibility of using relatively unskilled personnel for vital missions, are indicated in a series of flight tests with drone versions of H-13E rotary wing aircraft conducted by Bell Helicopter Co.

Remotely controlled Army H-13E helicopters were flown on simulated military missions by Bell engineers using both ground-based and airborne control equipment demonstrating:

- Takeoff, cross-country flight and landing by remote control from an accompanying mother helicopter.
- Remote control takeoff using a ground unit, picking up control of the drone by a mother ship in the air and transfer to another ground-based unit at the completion of the mission for landing.
- Takeoff by control from a ground unit, locking the drone helicopter on automatic flight, and engineering control for landing at the conclusion of the mission by another ground-based station.

Remote control from the mother helicopter included successful low-level

flights of the drone at 10 ft to 25 ft above test objectives to determine the feasibility of the mission with advice, according to Bell engineers, who note that the only deficiencies apparent were a lack of means of measuring the distance between drone and the mother ship and lack of information as to the drone's position and velocity with regard to the ground.

These areas of drone information should be relatively easy to solve, they report, adding that they were surprised at the small amount of information required by the new radio remote control equipment operator to fly the drone by the visual technique. The drone system need provided the operator with air speed, heading and approximate rate of climb and he also used the mother ship's instrument panel at a reference source.

Airside control is somewhat complicated by the fact that working in a visual form, the operator has difficulty in determining whether the drone has climbed to the mother ship but descended should the drone machine be displaced vertically with respect to the mother helicopter. Because the system utilized was relatively unsophisticated, the operator was limited in the degree of maneuver he could impart to the drone. Rate of turn of the drone was fixed at 5 deg per sec.

For takeoffs, the mother ship was hoisted 10 ft to 150 ft behind the drone and liftoffs were accomplished easily following some practice in developing judgment as to when the drone was high on the deck and liftoff was imminent. Actual flight of the drone was found to be very simple, with the mother ship positioned up to 15 mi. in front of, to the side or rear, at above or below the drone. Landings were accomplished from the mother helicopter by flying the drone to an approximately 1 mi. of the nearest control ground site and 750 ft above the ground.

Landings from the mother ship involved positioning the latter in tail behind the drone at a distance of 100 ft to 500 ft. The drone was flown to an altitude of 5 to 10 feet and an approximate hover, with the mother ship in a similar position. As the hover was achieved, the mother ship moved approximately 50 ft aft and 30 ft to the right of the drone, providing the operator with optimum ability to judge longitudinal and lateral translation and drone attitude.

Automatic flights, accomplished by taking the drone off from a ground control position, involved distances of approximately two miles without further maneuvers, with a normal landing accomplished by a ground control site.

Application of the technique to aerial delivery missions became ap-



ARMY H-13E helicopter drone flies under remote control. Bell Helicopter Test Pilot Al Averill is in left hand seat "loads off."



CONTROL PANEL 17 x 21 in. is held by sea pilot drone operator in cabin of 471-2.



FM TRANSMITTER for sending to drone is mounted on the mother ship deck.



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used as a result of the test. This, of course, is not the case.

• **Decoy drone concept**, whereby an assumed helicopter would be used as forward and trailing assets for a conventional transport or cargo helicopter. Equipped with weapons, they could be used to draw enemy fire during the main force, or to flush out enemy targets.

• **Remotely sensed**, whereby the assumed helicopter could be taken off from a ground control point, loaded with weapons, directed to the desired supply point via satellite flight and used, by completely automated personnel at the site with an optical equip-

ment to detect a vehicle of interest. To accomplish this, data as to the location of the site could be inserted in a computer in the drone. When the remotely sensed receiver the looking can and in a sight of ground personnel, a signal consisting of a long "dash" could be sent to the drone using the modulated continuous wave mode of a standard Area communications set. On receipt of this signal, the autopilot would search all lines computer-derived commands to ground resources.

The ground operator would command lead items for the drone by sending a series of dots and right turns.

By sending a series of dots, when the drone is maneuvered over the lead target, a long dash would command the drone to hover and at the same time a static attached to a cable is activated. The ground operator would take the data, drive it into the ground and then activate it switch on the static that would signal the drone to return, driving the helicopter toward the ground for landing. After unloading, the operator would take off on command and using television stored in the computer, fly back to its point of origin where it would be retrieved by the ground control unit.

Development of an airborne control equipment to provide greater latitude in maneuvering the drone helicopter within the current state of the art, Bell engineers report. A system providing sufficient sophistication for precise maneuvering at low altitudes to gain optimum benefits of low-level data targets, plus the capability of landing the drone at a distance of a half mile to a mile from the mother ship, could be done at a cost in quantities of 100 aircraft, for approximately \$10,000-\$15,000 per system, they estimate.

This would include a television air line in the drone with wide-angle and 11-line coverage for landing, and an eyeglasses display equipment for the operator—already developed by Bell—which would present the image seen by the camera TV camera at visual as truly as the eyeglass lens-half of the glass, allowing a field loss to look at the image from a fiber optic. The next project the display from a miniature TV display permitting the operator complete freedom of head movement. Bell states: Upper half of the glass would be clear to permit the operator to look by eyes from viewing the TV image on the glass; optical action to a direct view of the drone to monitor the action.

By Barry Miller

Los Angeles—Automatic computer-controlled ground checkout system which is intended to perform factory and pre-launch checkout of Midas infrared early warning satellites and their Agnus launch vehicles will be developed by three aerospace companies under contract to be awarded this summer.

The system is also to be applicable to other satellites, possibly including the Sevens photographic sun-ellipsoid and a weather satellite. Ultimately, systems expect it to set a pattern for the design of future aerospace spacecraft checkout systems.

Industry proposals for the design and development of the system, called SCORE (Simultaneous Computer Operated Readiness Equipment) were to be submitted last Friday to Lockheed Martin & Space Co., Van Nuys, Calif., which is conducting the competition. Lockheed is prime contractor for the Midas satellite system which is launched in the second stage Agnus B and in later versions, the Agnus D1 launch vehicle, also made by Lockheed. Between 54 and 35 satellites is believed to be also ordered for the SCORE program, from funds made available by the Air Force from the Midas budget.

Competing Companies

Organizations believed to have submitted proposals for the SCORE program to disassemble last Friday include Bendorn Systems, Control Data Corp., Packard Bell, Raytheon Systems, American Instruments, Conquest Electronics, Aerovox, Aerovox, Hughes, Radio Corp. of America's Data Systems and Aerospace Command & Control Division, a branch of International Business Machines and Electronic Electronic, a branch of Bendorn Electronic Systems Division with Thompson, Ramsey, Ward, and a Sperry Rand Corp. team comprising Sperry, Utah, Unisys, Raytheon Microwave and Wheeler Electronics. Among all 10 aerospace companies attended a first day SCORE system briefing held last week.

SCORE will consist of three sub-systems:

- Large digital computer and associated equipment, including a digital computer, control switching and storage.
 - Ground handling and support equipment.
 - RF telemetry equipment.
- Each of the incident can operate on one or more parts, but Lockheed has

AVIONICS

Midas Auto-Checkout May Initiate Trend

indicated no one company will be chosen to develop these two end of the three sub-systems. Much of the work

controversial competition will center about selection of the digital computer. Lockheed experts to retrieve the spacecraft, provided by the three prospective contractors, into a unified system.

Initially, SCORE is expected to be used at Lockheed's Sunnyvale facility where Midas is assembled and at an Air Force operations center, respectively, and maintenance facility. Ultimately, satellite system with only minor changes will be installed at an operational Air Force launch complex to give Midas a factually-based checkout sequence.

Practically, SCORE will permit three testing levels at factory and Air Force facilities.

In the first level, manual and semi-automatic special test equipment will be used for simple non-critical tests first component testing, including power diagnosis, calibration, adjustment and post and sub-component testing in operation.

At the second level, SCORE will provide for semi-automatic go/no-go component checkout to isolate and verify no-go conditions on components removed from the vehicle. Tests may also be used as automatic acceptance tests on purchased or subcontracted components.

The final testing level will provide complete automatic sub-system and system vehicle checkout.

At the Air Force facilities, automatic simulated launch operations with Atlas (dual stage, Midas booster) electrical in-flight simulation and in-flight launch testing may be performed with

the aid of launch and service equipment facilities, respectively.

The SCORE system at a launch facility will perform automatic go/no-go launch control monitoring. Actual specifications for the SCORE system represent a stepwise and refinement of the idea of more component unitarily bidding for a SCORE development contract. Lockheed had limited industry list now (AW Nov. 13, p. 77) on the system and requested interested companies to submit proposals from which specifications were derived.

System Objectives

The specifications as they evolved are thought to represent some of the better ideas about automatic checkout. One of the objectives of the system is to make it adaptable to any future aerospace launch control and enable needs with only minor modifications necessary for new sub-system test requirements, additional complexity and display representations and facility differences.

As previously mentioned, however, the SCORE system sure runs into a few technical roadblocks. Midas is actually contained within the Agnus vehicle, which is automatically checked out with the go/no-go. This could present certain problems in compatibility between the SCORE system and the Atlas (dual stage) booster checkout.

Among the general design objectives of SCORE are the following:

- Computer-controlled checkout—The general purpose, high-speed digital computer will control analysis and documentation of test results.
- Replacement manual-checkout equip-



GENERAL ELECTRIC'S JET FUEL NOZZLE

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The J85 — main engine fuel nozzle designed and manufactured for General Electric Company by Delavan — has been in use on G.E. turbojets since 1957.

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This same experience assures you of high quality fuel nozzles, fast prototype development and the ability to manufacture scheduled requirements on time at reasonable prices. When you need a special application engine fuel nozzle Delavan can help you.

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Bustring Recovery Kits

Washington—All American Engineering Co. has received an \$80,000 Army contract to design and test two recovery kits for the Atlas D133 helicopter to be used at White Sands Missile Range, N.M. for booster drone and instrument package recovery.

The new recovery system will be capable of withstanding packages weighing up to several thousand pounds since rocket boosters involved in White Sands crash the weight. The contract will be for the system to be operational this fall.

All American initially developed the system for the USAF Discoverer satellite program. It was later made a part of the recovery program for the recovery post carried on board the ballistic payload for the Echo 2 satellite launch.





USAF SPECIAL AIR WARFARE CENTER. Helix L-20s had Army Special Forces troops at a demonstration for President Kennedy at Eglin AFB. The L-20s are used for rapid deployment of troops engaged in counter insurgency operations.

USAF Revives Commandos, Studies Special

Eglin AFB, Fla.—Major expansion of the Air Force's Special Air Warfare Center here is planned to provide the first Air Commando units, increased counter-guerrilla capabilities.

Program calls for building center strength from its current level of 510 personnel to more than 5,000 men in mid-1963. At the same time development, testing and evaluation of tactics and equipment especially suited for counterinsurgency operations will be accelerated.

A little new field for industry participation in research is also planned, from new aircraft through a wide variety of sensing devices for reconnaissance and other equipment, appears to be in the making.

Research, the special Air Warfare Center is training officers and men to enable the Tactical Air Command to handle such guerrilla as guerrillas are now and providing the Army's special forces with such and use support for similar jobs. It also is training TAC personnel to act as instructors for Air Commando units and to train Special Forces troops who are sent to South Vietnam to assist the South Vietnamese in their fight against the North Vietnamese.

Under the Special Air Warfare Center command is Brig. Gen. Robert L. Pritchard, two new operational organizations have been established: the 1st Air Commando Group and the 1st Combat Application Group.

The 1st Air Commando Group, commanded by Col. Chester A. Jank, takes its name from the Air Commando Groups which fought in the China-Burma-India and Pacific theaters dur-

ing World War II supporting behind the lines activities of Allied guerrilla forces. Many bases of these probably were the 1st Air Commando Group, commanded by Col. Philip Cochran, which supported British Brigadier Orde C. Wingate's force behind the Japanese lines in Burma with transport, bombers, fighters, helicopters, search planes and gliders.

In current times, should the U.S. become actively engaged in limited war or guerrilla activity, would clearly follow the pattern of its World War II predecessor. The current group is an outgrowth of an order in May, 1961, from the Secretary of the Air Force that directed Tactical Air Command to develop a new counterinsurgency capability.

The 440th Combat Group Training Squadron was formed at Eglin Auxiliary Field 9 with an initial complement of 310 officers and men assembled by July 1, 1961. An initial detachment from the group was first deployed in August 1961, on a mission of training para troops for the new Armed Forces units of South Vietnam. In September, 1961, the 440th was declared operational and a second detachment was deployed to South Vietnam within 60 days to assist that country's armies and air force in C-47, B-26 and T-28 aircraft.

Specialized training units in the 440th now, declared operational and a second detachment was deployed to South Vietnam within 60 days to assist that country's armies and air force in C-47, B-26 and T-28 aircraft. Specialized training units in the 440th now, declared operational and a second detachment was deployed to South Vietnam within 60 days to assist that country's armies and air force in C-47, B-26 and T-28 aircraft.

assistance, cutting off of escape routes by use of anti-personnel weapons, taking out bases by use of supported heavy weapons, intelligence work, destruction of supply points, and use of psychological operations — harassment and counter-information programs and aerial broadcasts.

Initially, the Commando has a specialized World War II and early postwar vintage aircraft—the C-46, C-47, B-26 and T-28—some of these are types in general use in many countries and also are available from storage for ready deployment where necessary. Also having these are two other relative simplicity for operation under primitive conditions have been in the past prepared by the C-46 and C-47's easy use of these additional roles of cargo and personnel deployment and the C-47 has been rigid on its belly landing gear system for rapid unloading and fitted with auxiliary fuel tanks to double its range. The B-26s are fitted with 50-cal machine guns in the nose for strafing and also carry a wide variety of internal and external weapons, including varied types of bombs, napalm tanks, or rocket launchers. They can also be fitted out as high speed personnel transports carrying up to 16 fully equipped special warfare troops in the bomb bay, armed as specially fitted units. Two E-1C reconnaissance carriers may also be fitted. T-28s have been converted from the training mission into used as a support vehicle, with normal armament comprising two 50-cal. guns in underwing pods and four wing racks for bombs, napalm tanks and rockets. External auxiliary fuel tanks may also be fitted to extend endurance, when neces-



ARMOR OF THE FIRST AIR COMMANDO GROUP. (left) near Australia rifle hole. Douglas DC-1 is some equipped with belly mounted parachutes for psychological warfare, ground troop carrying capability for commandos. Rocket mounted itself is total light.



War Aircraft

For the delivery of weapons. Later additions to the aircraft fleet is the Helix L-20 STOL, light transport, capable of carrying three support special warfare commandos or complete equipment as aircraft controllers into very small, unimproved areas.

The L-20 is indicative of the center's interest in more equipment which fits its mission. Considerable study is going on to upgrade Air Commando capabilities.

The 1st Combat Application Group, commanded by Col. Benjamin H. King, is charged with developing, testing and evaluating new tactics and equipment for supporting TAC's counterinsurgency capabilities, and works closely with 1st Air Commando on weapon systems to be used on particular missions and special types of terrain.

Tactical doctrines concerned with equipment are the Operations Doctrine, currently headed by Lt. Col. James C. Pritchard, who has the most officers and does testing, and the Requirements Directorate, commanded by Lt. Col. Harold L. Bollenberger, which is the group's primary contact with industry in attempting to have new equipment applicable to the center's needs.

High-priority weapons being studied and sought by the applications group are all types of sensing devices to locate and track equipment and personnel through heavy overcast or forest cover. Reconnaissance equipment is one of the Special Warfare Center's biggest equipment problems.

Improved target marking devices that will permit for long periods of time and penetrate and slow through dense for-



DOUGLAS F-26, is equipped for special warfare with an M10642 for launch LAU-11A rocket launcher, 500 lb. ground support bombs and an LAU-11A for launch. On the wings are two Air Force reconnaissance bombs.



NORTH AMERICAN F-28, under study for two-step conversion, is equipped with two underwing mounted 50-cal. machine gun pods, two VDU-1100 50 lb. air bombs and two M17 rocket launchers.



DAGE RGS-10

GREW UP IN A TOUGH NEIGHBORHOOD

Shooting rocket engine blasts, high and low temperature extremes, bright sunlight and rain showers, fog, rain, snow, ice, salt spray, high altitudes — these made up the severe military and industrial environments the rugged Dage RGS-10 television system had to survive in to gain wide acceptance.

After recent tests conducted by the Air Force and the Astronautics Division of General Dynamics, the Dage RGS-10 system was chosen for Atlas weapons system support for the following reasons:

- Camera is certified to contain an internal explosion of 100/130 octane aviation gasoline. (Explosion proof per MIL E 30728—Proc. D)
- Certified operation under noise levels of 150 db . . . permits direct, close range observation of rocket engine blasts.
- Acceptable operation with line voltage fluctuations as high as $\pm 20\%$ from normal.
- Sync stability with power line frequency variations as high as $\pm 18\%$ from normal 60 cps.
- Excellent resolution and detail with 1000 ft. of video/shooting camera control cable.
- Satellite operation in temperatures from -30°F to 160°F .
- Thermally fixed EIA sync generator with a proven field see history.
- Immune to radio frequency interference.
- One-year warranty.

There are now more than two hundred Dage RGS-10 systems being delivered for use in addition and as support of every operational Atlas base across the nation. Here are a few other applications of Dage television systems:

Observation of eagle live materials
Army Chemical Center—Maryland
Burialight tracking
Patuxent Air Force Base—Florida
Nuclear test observation
Point Arguello—California
Rocket engine test observation
Red Stone Arsenal—Alabama

Rocket fuel observation
NASA—Wallops Island, Virginia
Reactor observation
Mendenhall—Washington
Eye for remote controlled tank
Fort Belvoir—Virginia
All-weather camera observation
Owens Hunt Air Station—Virginia

Other features of the Dage RGS-10 camera:

- 300 lines Horizontal Resolution at 15 mc Bandwidth
- Complete EIA synchronization and scanning exceeds FCC requirements for commercial broadcasting
- Multiple camera systems, common or individual EIA sync generators
- Completely transistorized construction
- 17-Watt power requirement
- Incorporates all necessary setup and operational adjustments
- 4-axis turret, zoom lens, pan and tilt, and remote focus available

The Dage Division of Thompson Ramo Wooldridge provides a complete range of cameras, controls, computers and other equipment as well as systems engineering and field installation and maintenance service. If you would like to learn more about the Dage RGS-10 or other Dage television systems and development capabilities . . .

Contact the nearest Dage TRW regional office—Atlanta, Washington, D.C., Los Angeles or Salt Lake City. (x)

Contact Dage Division Direct—Mishawaka City, Indiana. (x)

Check the Yellow Pages for your nearby Dage distributor.



Thompson Ramo Wooldridge Inc.

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at work...
ups output
cuts costs
of complex capsule***

When Alcoa engineers first got a look at this pen-sized aluminum capsule—no bigger than a softball—it took over 100 operations to produce. The Army Chemical Corps asked us to look into forging, extruding and other metal-working processes as a method of simplifying the job. Alcoa capability went to work. By the count, Alcoa knew how slashed away nearly half of the steps in production, resulting in a significant time saving in output and expected cost saving in large quantity production.

This is another example of what Alcoa total capability can do and is doing every day in the production of scores of defense items for all services.

World's biggest light-metals workshop, and Alcoa runs it. No other basic producer can match Alcoa production facilities, or our knowledge of the metal we produce. Alcoa is equipped to fabricate aluminum by every conceivable method. We have no axes to grind for any one process. That's why when you bring Alcoa a production problem, you can be sure you'll get a straight answer on how best to handle it.

Whatever it takes to do the job—castings, forgings, impacts, extrusions—Alcoa can do. Research, engineering, testing—Alcoa can do. How can you use our total capability? Write Aluminum Company of America, Jobbing Division, 1865 F Alcoa Building, Pittsburgh 19, Pa.

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Set John's reference to an explosion into the United Nations Commission.

I told him that we had just heard of one over the ocean at Nalida airport and we didn't know anything more. What happened? He said, "It blew up." I said, "Was that over the ocean?" and he said, "Yes." I said, "What happened there?" and he replied, "There was great smoke—great smoke."

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Aircraft Observed

It must also be noted that several witnesses who saw SE BTDY in the air before it disappeared in a bank or south or north, direction reported among its pilots in the air it turns ranging from 12 seconds to 4 or more minutes thereafter. The South African witnesses at the Rhodesian Board of Investigation, noting this discrepancy in time suggested that the possibility should be examined whether there had been two flights, one of them while the seventh was still in the air. However, when no flight was made with the witnesses observing the seventh from positions which they had occupied on the night of the disaster, one of

those witnesses, Mr. Poyner, testified that from the fourth night, before of his report being made, he must have seen SE BTDY through most of its parachute jump. He considered that it had disappeared from his vision only a few seconds before the crash. Some of the other witnesses also had made their observation from the ground would have lost sight of the aircraft several minutes earlier. Consequently, the time given in other witnesses may possibly be explained by their relative field of vision according to the altitudes or positions of the two men.

To another possibility of several witnesses, the Commission notes the area around the crash site, on several occasions in some witnesses during January 1962 to the effect that it successfully must have been the aircraft at Longbridge for the purpose of landing it. The story explained that the crash occurred when the crew tried to take over the aircraft from the pilot. While this story fits closely in the category of some, the Commission carefully considered whether or not it was true. Dr. Laidlaw and others who saw the plane take off from Longbridge testified that they knew it was not scheduled to fly previous to the crash. Moreover, Dr. Kato considered the possibility of there having been a second flight, while the pilot, who did not know how many planes were cleared, entered the scene of the crash in order to divert it. Aircraft had continued into the field but landed on the side of it. 2. Attack or external interference.

The Commission has carefully examined the possibility of SE BTDY being hit down in another aircraft or by attack from

the ground. It has also considered the possibility that the crash may have resulted from enemy action, or from secondary destruction of the plane by an attack or legend attack from the air or from the ground. The Commission has found no evidence to support such a hypothesis.

The Commission noted that several lines of evidence attached to the considered during the night of the night, particularly where the aircraft came and time of arrival was mentioned. While reports in the latter months, however, it is noted that aircraft landing at Nalida frequently, just close to the crash site and that the approach at SE BTDY to Nalida was a direct approach, usually two hours before the arrival, and estimated times of arrival were given in some instances in between. FIC and in Nalida there which could be easily anticipated by an external person. The possibility cannot therefore be ruled out completely.

Katanga Plane

The possibility of other aircraft being in the area of Nalida at the time of the crash was examined. Since the Fango Magazine of the Katanga Board of Investigation was reported to be the United Nations at Katanga, the possibility of an attacking Nalida was examined by the Rhodesian Board of Investigation and the Rhodesian Commission of Inquiry.

It was established that it could not have made the flight from its second base at Katanga to Nalida and back to Katanga, since the distance is greater than its operational range. It was also stated by its report and others that the Fango was in the ground at Katanga the night of 17/18 September and could not have operated that night. This evidence is not entirely clear since the report indicated that the Rhodesian Commission of Inquiry did not at least one aircraft the Fango had taken off from an airport track. While this particular track was said to be at its own private distance from Nalida, nothing would appear to prohibit the use of a tank, unless some of the Fango was in the vicinity of Nalida on the night of the crash.

The Rhodesian authorities have stated that they have no knowledge of any aircraft other than SE BTDY being in the air in the Nalida region between 1915-22 when CO BIC (General) and the fact that SE BTDY is presumed to have crashed. The Commission has, however, been satisfied that it might well be mentioned in the Nalida area during the evening and night of 17 September 1961, not therefore, the possibility of a "customer aircraft" must be entirely excluded.

Certain witnesses testified that they saw or heard a second, or even third, plane. In particular, some of these testified that they saw a second traffic aircraft flying close to SE BTDY that it had passed over the airport as immediately before the crash and that the aircraft appeared to be coming from the larger. The Commission noted with some of those witnesses the spots from which their observations had been made and determined to observe and describe what they had seen. The Commission considers that several of these witnesses are sincere in their accounts of what they believe of the

new. The Commission is also of the opinion, however, that these witnesses may have misinterpreted their observations and a second must include which may not be but have occurred in the way or at the time that they believed when they testified before the Commission.

The Commission notes that SE BTDY, a DC-4B, is a large aircraft that normally was in the Nalida area and was equipped with a red flashing anti-collision beacon located on its fuselage, high tail fin. It is noted possible that the "smaller plane" may in fact have been the tail fin of SE BTDY whose flashing beacon could have given different impressions depending on the angle of vision. This possibility is supported by witnesses' testimony that the smaller plane flew above and behind the larger plane at a fairly steady altitude.

The theory does not explain all aspects of this testimony, particularly the statement of some of these witnesses that the small plane flew over after the crash. It is possible considering the time lapse between the crash and their testimony, that some of the witnesses may have believed that they saw or heard phosphorescent marks, or that they did not, or that they misinterpreted as a single, two phosphorescent marks occurring over a larger period. Other witnesses showed strong anti-phosphorescent light and it is possible that some of their testimony was given by polished memory.

With the foregoing exceptions none of the witnesses who observed SE BTDY in flight saw the aircraft and disappeared from sight, saw another aircraft and/or saw or pointed towards the sound of gunfire before the crash.

Ground Fire

The Commission also considered the possibility of an attack from the ground. It was observed that there was no evidence that could have attacked a field of fire. On the other hand, an attack with property at Nalida would in the opinion of experts, have required a considerable number of troops, to suggest that this had taken place. No weapons were reported to have been in the field, nor an actual attack was seen as evidence of gunfire heard before the crash.

When the wreckage was first examined several holes were noted which it was thought might have been bullet holes. Close examination established the attribution of all of these holes that they were not the result of the possible explosion, but in the right hand window frame of the cockpit. At the suggestion of the Rhodesian representative, the Rhodesian Commission of Inquiry ordered a cinematographic examination.

The Commission, the United Nations Commission was informed established by the submission of the Swedish experts that they had not been made by a bullet.

Mr. Vining, a Trinidad official present before the Commission, stated that SE BTDY might have been struck by a burning light in a plane which was visible. This theory was based in part on an analysis of the statements of several witnesses concerning their observations of the aircraft in the air in the day. No substantial evidence was submitted in support of this theory, and the Commission is of the opinion that most of



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Campbell, Personnel Director.



Water Ballast Used on Boeing 707-320B

Ballast system aboard Boeing 707-320B jet transport was being installed to eliminate pressurized gas and weight during decompression and control. Federal Aviation Agency flight certification tests. Notes records of 66 altitudes levels containing 16 gals. each for total of 1,056 gals., or 10,176 lbs. Transfer of ballast to do it without danger of gravity from ballast forward to full alt in flight is accomplished here control panel in cabin aisle.



C-135 Simulator to Use Digital Computer

Mark II digital computer, developed by Link Division of General Electric, Inc., will be used on two USAF C-135 jet transport simulators (AW Post 11-91), undergoing a show-up and a test concept. Simulators will incorporate Link II-type motion actuators to provide realistic flight characteristics. The three-phase unit system was developed for the B55 simulator, also a linked in the C-135 simulator.

The phenomenon referred to as, Mr. Vining said, susceptible of other and more logical explanation. The Commission also noted that the aircraft was not in a position to be ground controlled, despite the fact that the simulators of such an aircraft. Finally, as already stated, no sign of a post-impact explosion or fire of a rocket motor found in the wreckage.

The Commission also noted the opinion of experts that had the aircraft been shot down, it would have been expected to have been at a steeper angle than that indicated by the path of the crash. Had the aircraft been struck and ejected, it would have been expected to have been at a steeper angle than that indicated by the path of the crash. Had the aircraft been struck and ejected, it would have been expected to have been at a steeper angle than that indicated by the path of the crash.

As mentioned in the simulators by the United States Civil Aeronautics Board and the Federal Bureau of Investigation, the simulators did not reveal any defects existing before the crash. Each simulator also had the same hardware system given by the Nide control system.

It was noted that at least one of the two simulators had all been attached to the back of the aircraft at the time of the crash. It was therefore unlikely that it had been used as a light. Moreover, it is believed that had there been a fire, most of the aircraft would have been destroyed by the fire. The fact that the aircraft was not destroyed by the fire is a strong indication that there was no fire at the time of the crash.

Finally, there was no evidence of carbon monoxide poisoning and the traces of carbon monoxide found in the cabin could easily be explained by other factors or by a fire inside the aircraft after the crash had taken place. While the possibility of a fire in flight cannot be completely excluded, there is no evidence of any kind to support it.

4. Human factors

(a) Representation of pilot. The theory was advanced that one or more of the pilots were not properly represented. The Commission did not accept this theory as a valid explanation. The Commission noted that there is no evidence in the medical reports that any of the pilots had been unable to perform their duties. However, there are some indications that the pilots were not properly represented by the simulators. The Commission noted that the pilots were not properly represented by the simulators.

No Pilot Fatigue

The Commission is also satisfied that the accident was due to pilot fatigue. In the circumstances, the following is stated:

(a) The total flying time from Los Angeles to Nide was only 1 hour and 30 minutes.

(b) There were three experienced pilots on board at least one of whom had 14 years of experience.

(c) There was no sleeping accommodation on board for the pilots.

(d) There was no automatic pilot.

(e) No evidence of pilot fatigue was found in the wreckage of the aircraft.

(f) The Commission noted that the pilots were not properly represented by the simulators.

(g) The Commission noted that the pilots were not properly represented by the simulators.

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(i) The Commission noted that the pilots were not properly represented by the simulators.

(j) The Commission noted that the pilots were not properly represented by the simulators.

(k) The Commission noted that the pilots were not properly represented by the simulators.

(l) The Commission noted that the pilots were not properly represented by the simulators.

(m) The Commission noted that the pilots were not properly represented by the simulators.

speech procedure for Nide is the fact, at the time. Thus, no government type graphic business work as the Congress over on its Nide chart which would be difficult to reproduce. Moreover, Captain Holloman is reported to have discussed with others the similarity in the names of Nide and Nide and the fact that the charts of Nide are very close to that of Eisenhower in Kansas with which he was thought to have been familiar. It is an error to believe that Captain Holloman was using the Nide chart from the Japanese Nide which was about the same as the Nide chart used by Truman. The page containing the Nide loading chart was missing from the copy of the Japanese Nide which was found in the wreckage. It is believed that the pilot is a captain, reported the page, the fact of loading from that base had been cancelled and clipped it next to him in the cockpit when it landed there. Thus the absence of this page is a strong indication that it was in fact being used.

(n) Missing of structure. The Commission examined the question of whether the crash could have resulted from a missing of structure by the pilots. It noted several serious reports in which experienced pilots had reported their situation. The most serious one took place to be a missing of 10,000 feet, due to the fact that the 10,000 feet was missing. The Commission of the aircraft was on the Nide chart, but changed this to be a missing of 10,000 feet. It is noted that the aircraft was on the Nide chart, but changed this to be a missing of 10,000 feet. It is noted that the aircraft was on the Nide chart, but changed this to be a missing of 10,000 feet.

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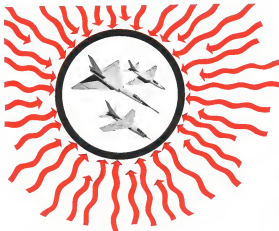


Mixed the Census Taker found a house and was left, "Three people lost there. The product of their ages is 1186, and the sum of their ages is 46 years." After a hour of exploration Myerson returned for more information. The house owner said, "I forgot to tell you that my son and grandson live back with me." How old were the occupants and what were their professions?

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ANSWER TO LAST WEEK'S PROBLEM: The highest possible answer is 211; therefore, the root is less than 300 but it can't be over 200 because it is a palindrome it would not be a prime. Being in the 100's the first square of the number can only be 01 or 81. Only 5 or 9 as a central digit will yield these. Therefore, 3441 = 591.

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instrument approach and period, that "talked" about it, shows us the reason that ended in the portable electronic characteristics of the war. Consequently, it is necessary for both in making further progress and speed higher receiver performance. Instrument approach charts for Nalida as double independent (not lights in the corner of the aircraft). In the area of the instrument team and in the approach into there are under spot heights of elements are better contacts. Now do the guides are more clearly adequately against the direction. If he said when the pilot had described in 1980 how he might not have been aware that his subject of safety was the focus was in mind. The pending current, therefore, he completely excluded that the danger may have resulted indirectly from incomplete information supplied. In the pilot he was in the most critical phase of his flight to Nalida.

Arrival Time

Except for the fact that the departure from Lapeleville was the arrival reason almost all late on the afternoon of 17 September and that the aircraft took a few direct route increasing an additional hour and a half to two times and a 10% of flight, there does not appear to have been

any delay in its arrival into Nalida. It is that the aircraft arrived over the island some minutes before its first estimated time of arrival. It will be noted in the following part of the report when the aircraft descended, operations were, that it might have delayed its landing or flew off elsewhere. Indeed it had crashed during what must have been its approach to the airfield with the intention of landing.

In concluding its report, the Commission wishes to submit the following summary of its views on the conditions and circumstances surrounding the tragic death of Dag Hammarskjöld and the members of his party.

The Commission believes that the decision to leave the Nalida base on the afternoon of 17 September 1961 was taken by the British Command based on view of the situation which he had in position. In taking that decision the Secretary-General was fully aware that the flight would have to be carried out without escort and that most of it would be over the night. The Commission also believes that the time of the aircraft descent for the Secretary-General was fully qualified to undertake the flight, to recognize its risks, and

to find it Nalida as declared. The Captain and the other crew members were experienced, competent and conscientious. No criticism of the solo landing flight hours of crew members appears to have been considered.

Plans Awareness

The Commission is satisfied that the Secretary-General's aircraft had been properly maintained and was fully airworthy. It believes, in particular, that the damage suffered by the aircraft at Thabaria Hill on the previous night had been adequately repaired. The Commission observed that no flight plan or departure message was communicated to the FIC at Juba. It is of the opinion that the accident occurred by the limitations in Katanga, in particular by the activity of the 9th aircraft equipped for aerial combat which was at the time in the service of the Katanga armed forces, against the departure from the rules applicable to international civil aviation.

The Commission reports further that before the aircraft was dispatched on its last mission, it was given to a responsible official of ONUC of the area, which the pilot intended to follow. It also believes that special security measures should have



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Scenes of wind tunnel tests have been carried out by General Electric, Cincinnati, and National Aeronautics and Space Administration's Ames Research Center on full-scale VTOL tests using model vehicle under G.E. contract to conduct research on Army's lift fan flight research program (AFR-65-19 p. 14). Wind tunnel tests proved acceptability of lift fan performance, structural characteristics, turbine operation and aircraft stability. Wind tunnel model and much of test hardware were fabricated by NASA, while G.E. fabricated and tested propulsion systems including two lift fans, one turbine driven and two VTOL engines.

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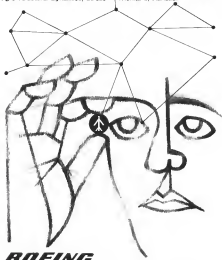
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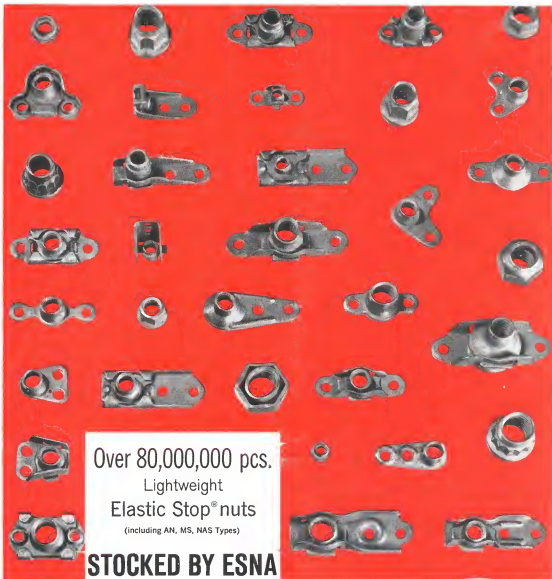
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